AMERICAN MACHINIST

June 26, 1940

Learner—*A recruit in industry's army watches attentively while an experienced machinist explains the operation of a radial drill*

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R. R. GROVE, *Works Manager*
Cameron Iron Works
Houston, Texas

"Many consultations are held in which the advertising pages of *American Machinist* play an important part."

WHAT'S IN THIS ISSUE

MORE MEN

Yes, the aircraft industry still needs more men. And the situation is likely to become more acute as British plane demand increases and U. S. defense moves are speeded. If the men aren't available, there's only one thing to do—train them. That's just what the aircraft makers are doing.

Possibly the most exacting work in the entire aircraft industry is required on engines. So it's not surprising, therefore, to find that in engine production the skilled labor shortage is most acute. In our last issue we described what Wright Aeronautical is doing to overcome this situation; this time we take you behind the scenes in Pratt & Whitney Aircraft to let you see how they train men in a hurry.

P&W has one of the most comprehensive apprentice training programs we've run across. When a supervisor remarks that "They're so good, they'll have our jobs before we know it," then you know their apprentice program is really working. But that's not all. College men are being groomed for junior executive and engineering positions, and even the older workers are not forgotten. All can attend courses given by the state in cooperation with the company; in many cases the firm helps defray expenses. Read about it on the next page.

FINAL FINISH

Machining die castings is an operation that can run into a lot of money if you're not careful. Often the way out lies in novel fixtures; sometimes specially built machines prove cheapest. Stewart Die Casting Division, of Stewart-Warner Corporation, has run up against both kinds of cases. Herbert Chase has dug up five typical examples of tooling for final machining and tells about them on page 454. If you'd like to boost output or cut costs, you'll be interested.

FLAME MACHINING

A subdivision of the oxy-acetylene cutting process, flame machining, is rapidly coming into its own as an efficient production tool. There is hardly an industry which could not profitably use some form of this exceedingly versatile method. The progress of the past few years has been truly amazing. Control and technique have been perfected so that a wide

J. G. MAGRATH

variety of operations can be performed on many different classes of work. In the first of a two-part article on this subject, J. G. Magrath, of the applied engineering department of the Air Reduction Company, outlines many present uses of the process and touches on possible future developments. It begins on page 456.

PULL

The nearest thing to mass production in the Consolidated Aircraft factory is achieved by a 60-ft. draw bench, where a 50-hp. motor provides plenty of pull for rolling all kinds of sections from strip stock. Far from being a minor part of production, this device has played a major role in helping to boost the capacity of this west coast plane plan. The function it serves, and the way the department is set up, are described by Consolidated's Larry Boeing, who is inspector in charge of the metal crib. It begins on page 462.

LARRY BOEING

CONVERSION

From contour projector to toolmaker's microscope, and vice versa, in less than five minutes is the trick made possible by the set-up described on page 460. E. Willard Pennington tells how a popular model Bausch & Lomb projector can easily be converted into an efficient toolmakers' microscope of exceptional range—without spoiling its function as a projector, either. Stock parts from Bausch & Lomb and Brown & Sharpe, plus a "homemade" accessory or two, make the revamped device a precision job.

SHORT CUTS

On page 465 you'll find another batch of Short Cuts for the Small Shop, compiled by A. H. Waychoff. Judging by the letters commenting on this recurrent feature, it may be that we've misnamed it. For many are written on the letterheads of some of the largest plants in the country. So we take the liberty of recommending this week's batch to *you*, whether your shop occupies a county, a floor or a corner of the cellar.

HOW TO STRIP

Are you interested in decreasing die maintenance? Then we suggest the second article in the series, "Die Design for Low Maintenance," which starts on page 466. Last issue's session, you remember, was devoted to the use of guide posts; this time Joseph I. Karash, the author, takes up the question of which stripper mechanism to employ. As a member of the tool design department of Reliance Electric & Engineering Company, Mr. Karash is in a good position to cover the subject thoroughly. His series on die design for low maintenance will continue through two more issues.

COMING

Designing plastic molds for trouble-free production is the aim of every good mold designer. In a forthcoming issue will appear a four-page article on this very subject by G. P. Lehmann, of General Electric Company. Fool-proof operation is an advantage often overlooked, says he, and he provides many pointers to help in the future. Look for "Practical Molds for Plastics," in an early issue of AMERICAN MACHINIST.

Cincinnati
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TURRET LATHES

RETAINING ACCURACY UNDER HEAVY CUTS

. . . the kind of performance that results from advanced design, ample power and sturdy construction.

This #3-S CINCINNATI ACME in the plant of the Dravo Corporation, Neville Island, Pittsburgh, Penn., is employed in turning, boring and facing large sheave hubs and similar parts. The hub shown is of SAE 1060 billet steel 8¼" long and 10¼" diameter.

Close tolerance are being easily maintained under heavy cuts which is typical performance of that available on this heavy duty machine.

This #3-S CINCINNATI ACME Universal Turret Lathe is of improved design, with large capacity and with ample speeds and feeds for high production cutting tools. Detail specifications covering the features offered are available on request. Ask for a copy of Bulletin G-102.

...The ACME MACHINE TOOL CO.,
...CINCINNATI, OHIO.

More men more planes

Educational Supervisor Smith interviews an applicant. A high school diploma and physical fitness are requirements for the apprentice training course

When skilled men can't be hired P. & W. Aircraft creates them. Here's its four-fold plan for immediate and future needs

AIRPLANE ENGINES are needed urgently. Their making calls for more machines and more men. The Pratt & Whitney Aircraft division of the United Aircraft Corporation has recognized both these needs—and has provided for them. Already this company's plant capacity has been tripled; now it is launched upon a program to add another 50 per cent to its present output.

Men—skilled men—are required; men who can qualify to meet the strict requirements of the nation's most exacting industry. Pratt & Whitney Aircraft's procedure is designed to supply them. It includes:

1. The long term training of high school graduates to become highly skilled technicians.

2. The grooming of college men for junior executive jobs.

3. The employment of "learners"—men with limited training—and adapting them to the special requirements of airplane engine building.

4. The special training of present employees—men and women—to make them more capable producers.

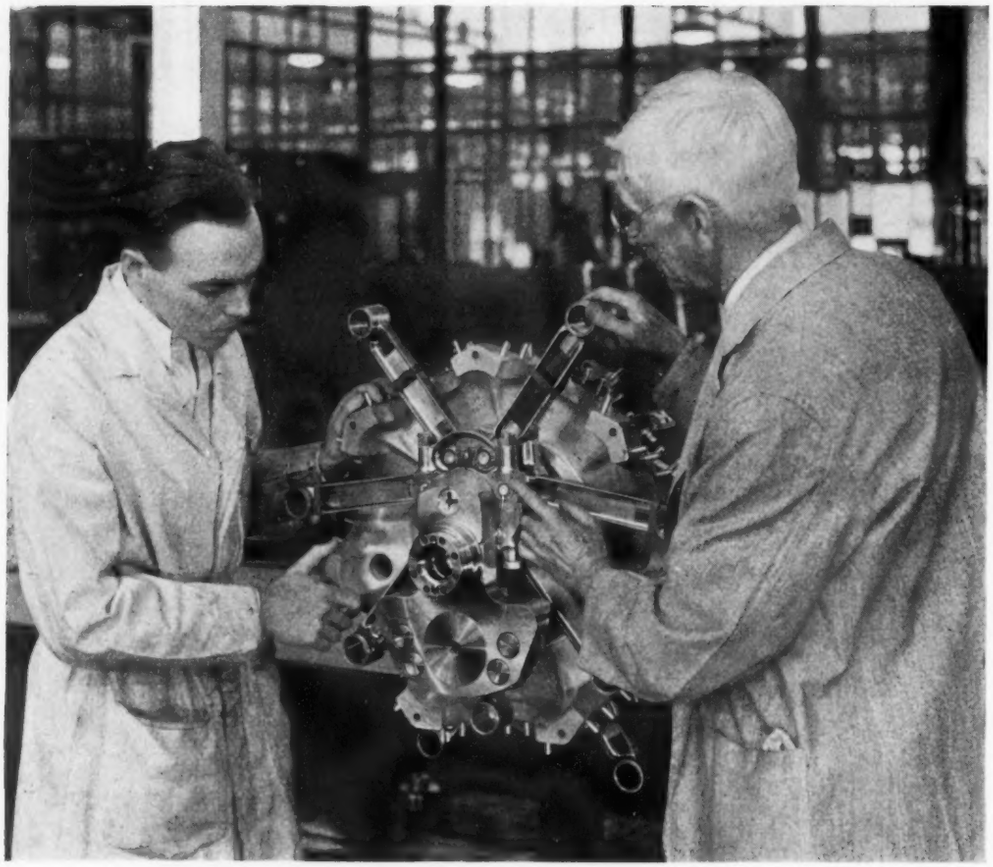
Each phase of the program fills a specific need; each is treated separately but as a part of an integrated plan.

The Apprentice Training Course takes boys eighteen to twenty-one years old with high school diplomas. They must have passed four years of mathematics, one year of chemistry and one year of physics. They must be in first class physical shape.

Three years are required to train a boy to become a machinist; four for a toolmaker. So thorough is the schooling of apprentices, however, that upon their graduation they soon become group leaders—key men in the shop organization.

The apprentice course was started in March 1936 and is now beginning to bear fruit. Nearly 200 men are enrolled with twenty new applicants being added each month.

Training is divided between shop work and class work. The shop experience is gained in the manufacturing departments on bench work, heat-treating, machine work, plating, motor assembly and engineering. Pros-



Apprentices work with their heads as well as their hands. Here is Henry Cudworth, oldest P. & W. Aircraft employee, showing a youngster the secrets of airplane engine assembly

pective tool makers devote their fourth year to the toolroom on jigs and fixtures, and on machine repair.

Each apprentice is rotated through the various departments, spending not over twelve weeks in each. He learns to lay out work and to machine it accurately. He works 36 hours a week at these tasks and is paid while he learns.

Then there is his classroom work. The apprentice is required to attend classes four hours a week or approximately 640 hours in the four-year course. His time is divided as follows: 30 hours on blueprint reading (including free-hand sketching and lettering); 120 hours on machine drawing; 260 hours on shop mathematics; and 230 hours on the theory of the trade (machine and electrical). To cite just a few of the many specific topics these general headings cover, the apprentice studies machine feeds and speeds, thread shapes and computations, simple and compound gear trains, belt and pulley calculations, tapers and dovetails, cams and link motions, gear tooth calculations and materials of construction.

These courses are supervised by the Connecticut State Trade School as part of its part-time trade extension course. For convenience, classes are held in five classrooms within the Pratt & Whitney plant. The apprentice is paid for this classroom work as well as for his shop work. On the satisfactory completion of his course, he receives a bonus—$75 for a three-year apprentice, $100 for a four-year apprentice.

Technical Studies Offered

At the end of his first six months training, the apprentice at his own option may enroll in the apprentice technology course under the auspices of the University of Connecticut. Most students elect to devote six hours of their own time to this advanced class work with the full knowledge that their studies will require approximately twelve hours weekly of home preparation. These classes are also held at the Pratt & Whitney plant with the exception of laboratory work (two hours weekly) which is done at the University in Storrs, Connecticut.

The technology course covers subjects similar to those found in any first class engineering college. They include general subjects, such as English composition and Government; and technical subjects, such as thermodynamics and strength of materials. Three and a half years are required to complete the curriculum.

But this does not complete the apprentice's opportunity for learning. He visits other plants, particularly those of machine tool and small tool manufacturers. If he is specializing in a particular class of work, such as gear cutting he may spend as much as three months at the Gleason Works or at the Fellows Gear Company.

Is it any wonder that Pratt & Whitney Aircraft apprentices soon become key men? "They're so good," said one department supervisor, with a twinkle in his eye, "they'll have our jobs before we know it."

All of the appenticeship work is supervised by a committee consisting of the general superintendent, the assistant factory manager, the supervisor of the experimental machine shop and Harry C. Smith, educational supervisor, who acts as chairman.

The student training course takes college graduates of U. S. citizenship not over 25 years old, having degrees in mechanical, aeronautical or industrial engineering. The course extends over two and a half years.

If machine experience is desired, the student may take instruction for four hours a week during the first six months at the Connecticut State Trade School. He may also elect to

take graduate work in technical subjects or in industrial engineering at the University of Connecticut. All such work is on the students own time, but the company will share half the cost of postgraduate work.

After selection, the student enters a three-month probationary period. He works in various shop departments for periods ranging from two weeks to three months as follows:

Crankcase	2 weeks
Cylinder	2 weeks
Connecting Rod	2 weeks
Screw Machine	2 weeks
Crankshaft	7 weeks
Bearing	2 weeks
Heat Treat	2 weeks
Tool Room	2 weeks
Stock Chasing	1 month
Assembly & Test	3 months
Engineering	3 months
Airports	1 month
Service	2 months
Service Inspection	2 months
Installation	2 months

Both students and apprentices are required to pass periodic examinations in the progress of their work. The company reserves the right to assign a student to a permanent position at any time, thus terminating his course.

Where Speed Is Needed

The two courses outlined above are excellent sources of well trained personnel. But what about periods of rapid expansion where shop men are needed quickly? Pratt & Whitney Aircraft wants skilled men and hires them when it can. At present the demand exceeds the supply. So it has developed a "learner" plan whereby untrained or semi-skilled men work along with experienced workmen. Their work as helpers in the course of weeks familiarizes them with the plant and its requirements. Those who show aptitude soon become machine operators on the less exacting classes of work thus releasing older men for other tasks.

One source of learners is the 200-hour training course sponsored by Governor Baldwin's Reemployment Committee. Trade school facilities in four Connecticut cities, Hartford, Manchester, New Britain and Bridgeport are made available to unemployed men between the hours of 11 p.m. and 7 a.m. when the schools are not devoted either to daytime or evening classes. Instructors are furnished by local industries; Pratt & Whitney Aircraft has supplied three for the Hartford and Manchester classes. Two apprentice school graduates have already served periods of instructorship and find their own training enhanced by their teaching experience.

Originally these night classes were set up for the retraining of skill-rusty workers—machinists who had lost their touch with shop work by being forced to take other jobs during the depression. However, the "skill-rusty" machinist has failed to materialize; practically all the applicants are youngsters without previous experience in the trade. Some of the best are from neighboring farms —boys who have learned how to turn their hands to useful tasks.

Pratt & Whitney Aircraft has employed some 200 boys, so trained, as learners. The short course is inadequate to give them much, if any, mechanical skill. In addition, the trade school equipment is old and limited in variety.

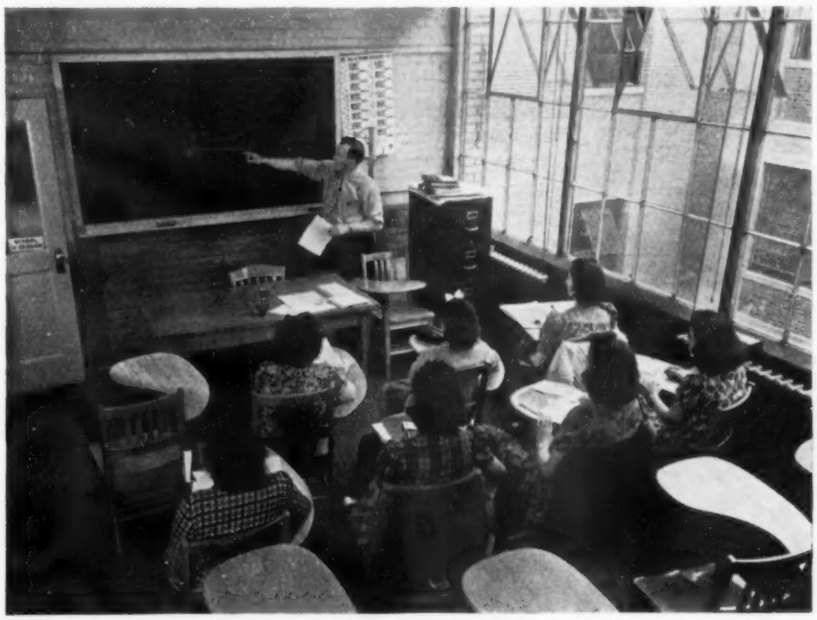
By devoting five weeks, five nights a week, eight hours a night to the course, however, the short-course graduates have demonstrated a willingness to learn. They have at least found out that steel cuts steel. They have learned not to be afraid of a machine tool; to keep it clean and well oiled; to plan their work and not to toss finished parts into a tote box where the machined surfaces will become burred and dented.

The fourth phase of Pratt & Whitney Aircraft training is for present employees who wish to acquire greater skill. These courses are optional. They consist of four hours work a week over a six-month period. Most of the applicants are employed in the inspection departments. They learn blueprint reading and shop mathematics. Separate classes are conducted for men and girls. Some 30 male inspectors are now taking this work, and their courses are naturally more advanced than those for the girls. These classes are also conducted by Trade School instructors in the plant class rooms.

Thus goes the four-fold program that is making more men and women available for aircraft manufacture. These learners, apprentices and students are all fired by an intense interest in their work. They enjoy working with their hands; they experience the thrill of seeing precision parts produced as a result of their handiwork.

With all the accent on youth, what of the older workers? Pratt & Whitney Aircraft does not discriminate because of an applicant's age. If he can do the work, he gets the job. In fact the skill of the older man is appreciated and sought after; one of the advantages of this company's location is the availability of Yankee craftsmen. Some 1100 plant employees are now over 60 years old. As the company is comparatively young, this fact means that these men were hired after they had reached middle age or better.

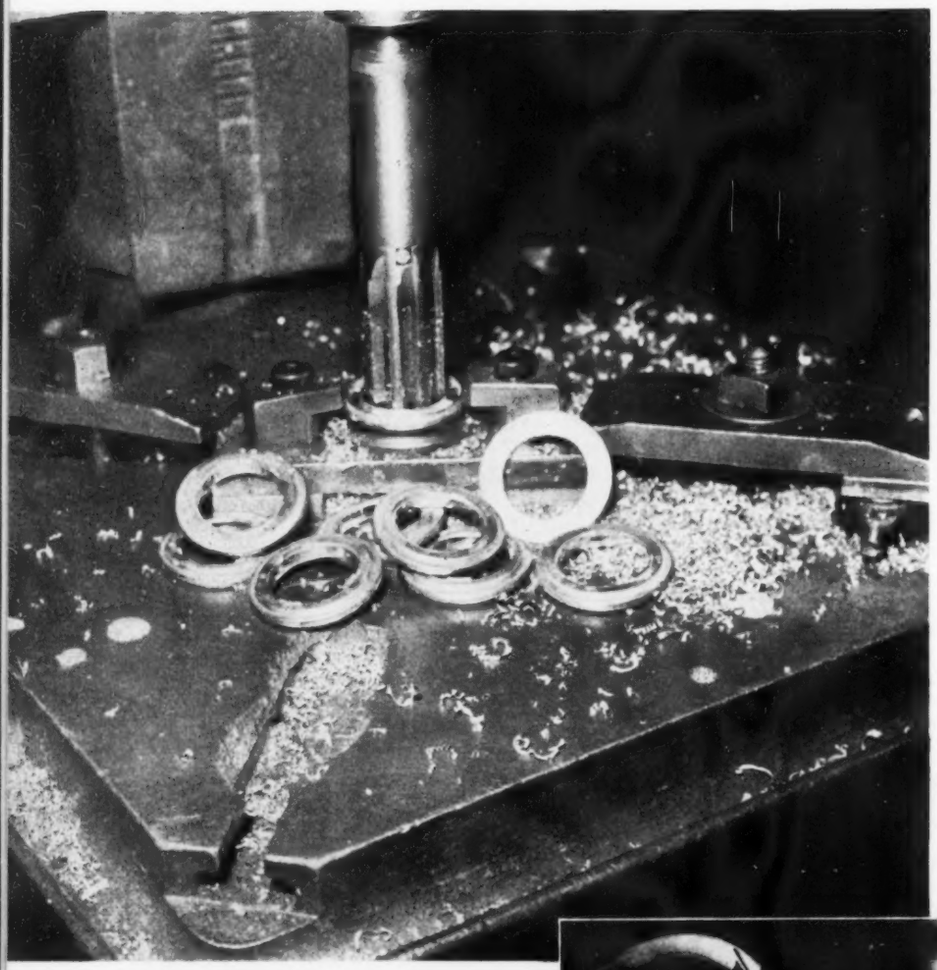
So young and old join hands to meet a pressing need. When planes hum overhead these workers have the satisfaction of knowing that they have done their part in building dependable engines for the safety of those aloft.



Girls too are given an opportunity to learn. This group of inspectors gets instruction in blueprint reading and shop mathematics

Fixtures for final machining

BY HERBERT CHASE



Die castings usually need some machining to hold tolerances or improve appearances. The key to high production and low costs often lies in simple fixtures

ZINC ALLOY die castings produced by Michigan Die Casting Company are held to remarkably close limits as they come from the die. But flash must be removed, and other machining operations are required where it is not feasible to hold casting dimensions as close as specified. Some of the economical fixtures for this purpose are well worth study, as they contribute much to the over-all savings realized in this plant.

Parts Needing Precision

Among other castings which must be held within close dimensional limits is a camera focusing ring having three helical surfaces. To avoid marks of push-out pins on the finished part, it is cast with three thin spokes against which the pins bear. In the first machining operation, the spokes and flash are cut from the hole

Focusing rings for cameras are reamed in a drill press, above. Integral lugs engage corresponding recesses in the fixture to keep the part from turning

At right, outer diameters of the rings above are finished with a carbide tool advanced by hand against a stop. Part is driven by a cylindrical dog which is mounted in the drill press spindle

in a simple shearing die, after which the hole is sized in a reaming operation, using a simple holding fixture having recesses which fit small lugs cast on the back of the piece to prevent it from turning.

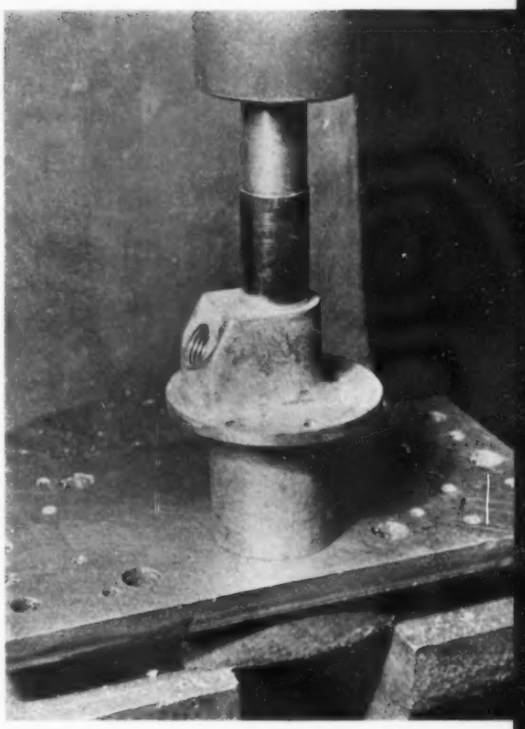
To hold the outside diameter within the required concentricity with the hole, namely 0.0015 in. indicator reading, the piece is set over a short rotating mandrel in a fixture mounted on the bed of a drill press. Rotation is imparted by lugs in a cylindrical dog in the press spindle, the lugs engaging corresponding recesses cast in the piece. The carbide-tipped tool for turning the outside diameter is clamped in a holder which turns about a pivot when advanced by a handle, until the holder comes against an adjustable stop which is set for the required diameter. About 350 pieces are turned per hour in this set-up, a higher rate than for a similar lathe set-up, partly because of the greater convenience in loading.

An unusual operation is performed on an oil-burner part having a central hole cored with the usual draft and about 0.001 in. under the size required in the finished straight hole, which has to be held within 0.7495 and 0.7502 in. Sizing is done with a burnishing tool, a hardened and ground tool steel cylinder having its lower end slightly chamfered. This tool is merely pushed through the hole, using a simple arbor press. The hole not only is accurately sized and straight but also has a highly burnished surface. Production is 200 pieces an hour.

Fins From Shift Link

A cored slot and three cored holes are required in castings which form part of an automobile gear-shifting mechanism. A fin is left where the core for one hole and that for the slot come together, and is removed by using a slender end mill with the piece held in a welded steel fixture set in a drill press. The pivoted bar in front of the die casting holds the piece in position as the end mill is advanced by the operator's other hand. 350 pieces an hour are handled in this set-up.

To finish a surface in the bottom of the slot in this same piece, it is clamped in another fixture. It is mounted on a slide advanced by the pivoted bar, at the right, as a standard ½-in. spiral mill makes the cut. The L-shaped lever is a quick-acting lock which holds the piece securely. The mill is piloted by a hardened bushing in the arm of the fixture directly above the piece. 350 pieces an hour are milled in this fixture.



Hole in this oil-burner casting is enlarged about 0.001 in., given a high finish, and held to within 0.0007 in. by forcing a hardened and ground burnishing tool through it with a press

Operations on this automobile gear-shift part include cutting flash from inside a slot with an end mill, left, and finishing bottom of slot with a spiral mill, right.

Quick-clamping devices and hand-operated feeds permit rapid reloading and fast machining of die-cast automobile gear-shift parts

Flame machining

BY J. G. MAGRATH, AIR REDUCTION COMPANY

With notable records in cutting and welding, the oxyacetylene torch turns to surface shaping. Plate edge preparation is one of the applications

FLAME MACHINING, a subdivision of the oxyacetylene cutting process, includes various surface shaping operations; as a formative process for the preparation and shaping of steels, it is becoming increasingly valuable. Widespread interest in certain operations of the process, flame gouging for example, indicates a broad and undeveloped field.

The rapid acceptance by the steel industry of flame deseaming, another sub-classification of flame machining, providing increased production at reduced costs, has centered attention upon further extension of the oxyacetylene process. Higher production rates have resulted in an increasing number of specifications calling for U- and J-groove plate-edge preparation. Shops not equipped with planing machinery are prevented from bidding on this work. Shops having such equipment often find themselves overtaxed to meet production and must employ their planers for heavier work. Such conditions, as well as the development of improved apparatus, have further focused attention on oxyacetylene plate-edge preparation.

The interesting specimens in Fig. 1 were prepared in the early days of the process development.[1] A number of its classifications such as deseaming, rivet cutting, punching and lancing, all accepted under their individual classification names, are proved procedures, in practice for a long time.

Flame machining consists of removing metal by surface oxidation. It is analogous to machine cutting, the tool being a comparatively large oxygen stream impinged on the work at an acute angle. With correct technique, a gouge, groove or cut of predetermined contour and dimension is made in the metal, without completely penetrating through the work, as in severing with flame cutting. Different sized tips, working pressures and degree of angle provide for variation in shape, width, and depth of gouge, groove or cut.

In 1933 the Oxy-Acetylene Committee of the International Acetylene Association[2] described flame machining and sub-classified it into its various sub-divisions. The diagram, Fig. 2, gives these accepted sub-classifications. A brief outline of these follows and a complete description can be obtained in the aforementioned publication and its more recent editions.

Planing — The several types of tangential cuts so classified differ in their application and their tolerances, as

[1] An early article on the subject is "Machining With Oxyacetylene" (AM—Vol. 76, page 1217).

[2] Report of Oxyacetylene Committee, International Acetylene Association Annual Meeting, Chicago, Ill., September, 1933, pages 57 and 58, and 80 to 87 inclusive.

Fig. 1—These specimens, prepared in the early stages of flame machining, show the versatility of the process

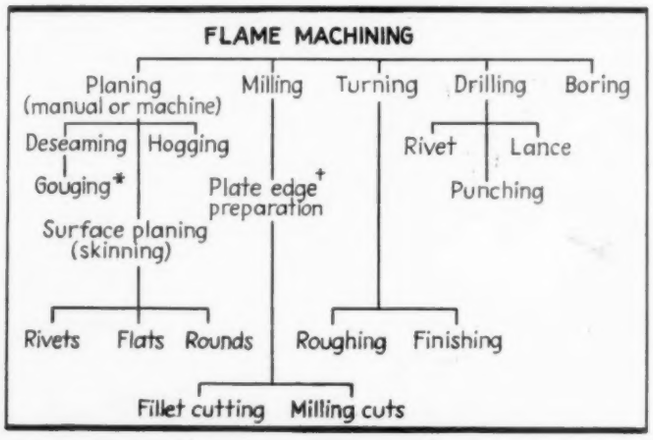


Fig. 2—Flame Machining Classification Diagram

* Gouging not indicated on original diagram; pending official classification, it is classified with deseaming with which it has been recently associated.

† Plate edge preparation not indicated in original diagram, but is classified in the text, page 84, report of Oxy-Acetylene Committee, 1933.

well as the degrees of surface regularity attained or permitted. A milling cut of various contour is produced by the flame either singly or in a series of overlapping or trailing cuts. The operation may be manual or mechanical and is further sub-divided as follows:

Deseaming: The removal of cracks or surface seams, scabs and other defects from blooms, ingots, billets, slabs and rounds, enroute to various finishing departments of steel mills, and cracks and sand holes in steel castings.

Gouging: Removal of tack and defective welds; welds in steel scrapping operations; defects from steel castings and manual grooving.

Hogging: Removal of superfluous metal from steel castings; removal of risers and sprues, the location and character of which is such to make it difficult or impossible to dispose of by ordinary flame cutting.

Surface Planing: Removal of metal, on either flats or rounds, by parallel gouges adjacent to one another, for the purpose of removal of wide surfaces. This application is in practice today under the name "skinning." In the case of rivet head removal, this is a proved procedure, in practice at present, using standard rivet-cutting tips.

Milling — Cuts similar to those produced by rotary milling machines. Plate-edge preparation is the most popular application of this classification at present. Figs. 3 to 10 indicate the possibilities in this field. A more complete description of this application is given later.

Turning — While turning cuts are not fully developed at this time it is reasonable to expect developments soon; the work illustrated in Fig. 1 indicates strong and interesting possibilities of success in this field. In brief the round object may be mounted on a lathe spindle, and the oxyacetylene torch mounted in the tool post. A flame milling cut is made, at zero feed, for reducing the diameter of the object and producing a deep, straight sided cut, of a width equal to the flame width of the tip size selected. Where a spindle or journal cut of extended length is required, the cut is started by successive centric passes of the flame at one end, and then progressed for the journal length by directing the flame against the vertical wall of the milled cut.

Drilling — Piercing holes partially into or through steel.

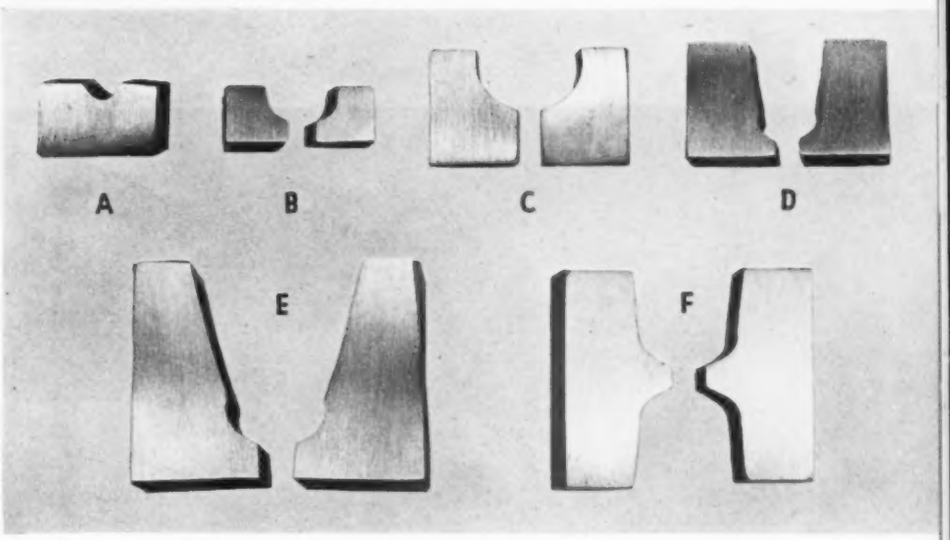


Fig. 3—These cut specimens were prepared by the oxyacetylene flame machining process

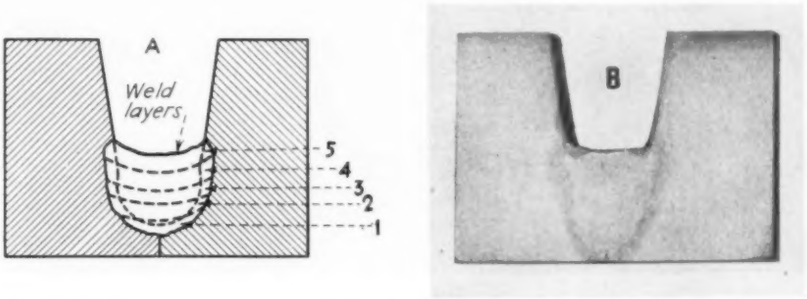


Fig. 4—After edge preparation, the butted plates (heavy section) are shown partially welded in the U-groove

Rivets: An alternate procedure of removing rivet heads. The tip is held in line with the rivet, close to the head, the preheating flames impinging on the head center. When the kindling temperature is attained, the oxygen stream is turned on, oxidizing a crater in the head and consuming it. The shank of the rivet is then knocked through the hole. This procedure is now being employed.

Lance: This is a proved procedure now in wide usage.

Punching: A form of flame drilling consisting of depressing a round hole for centering or piercing purposes. Where the operation is of a depth beyond the reach of cutting tips, the lance is used.

To assure satisfactory performance and the proper surface for welding or finish machining, apparatus design, manual or mechanical technique, and metallurgy must be in correct relation. Each individual problem will prescribe its own procedure for flame machining.

Sufficient control of the oxygen stream and technique in the manipulation and juxtaposition of torch and workpiece were acquired at an early date to produce such experimental studies as illustrated in Fig. 1. The subdivisions of flame deseaming, gouging, rivet cutting, lancing and punching are widely employed by industry. Flame milling and turning are still in their critical stage. Plate edge preparation is being rapidly developed and will serve, in its present stage, for answering a number of industrial problems; patience must be exercised in its introduction.

Present codes permit steels having a carbon content of 0.35 per cent or less to be flame machined. This applies to such steels when used under the specifications for plate for boilers and pressure vessels, covered by Sections U-72 and U-72j of the ASME Boiler Construction Code, which allows for plate-edge preparation by mechanical means or "melting." On all other steels for use outside of the ASME and the API code specifications, the same precautions, such as preheating, should be observed as when severing with flame cutting.

Standard machine flame-cutting torches and supplementary oxacetylene apparatus are employed in flame machining. Cutting tips with standard expanding orifices, as made for rivet washing, with either round or flattened sides to permit of entry into narrow grooves are used. These tips

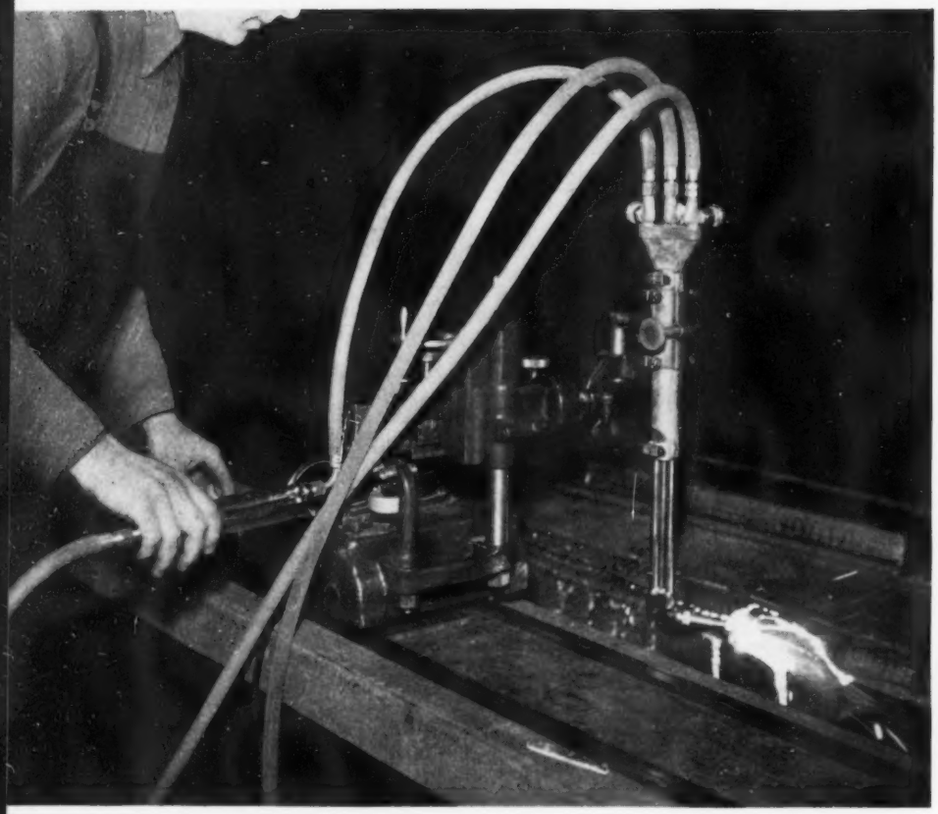


Fig. 5—The initial root groove of a U-groove is flame machined in a 2-in. plate employing a radiograph

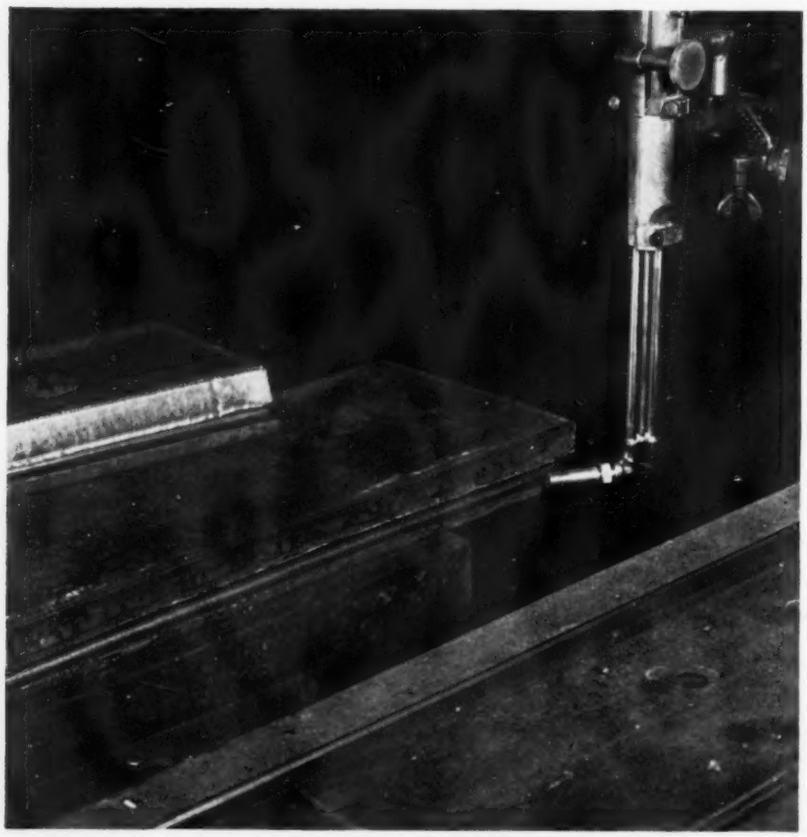


Fig. 6—The completed root groove of a U-groove appears as above after flame machining at 32 in. per min.

are available either in straight or bent form, to suit individual preference, and for use in standard torches with either 90, 75 or 45 deg. heads. All torches can be mounted in the standard torch adjusting arm available with the radiagraph; or the torch adjusting arm may be mounted on any machine tool in the user's plant.

The preparation of plate edges by oxyacetylene flame machining is fully illustrated in Figs. 3 to 9 inclusive. Fig. 3 shows photographic studies of cut specimens prepared by this process. Each of these sections were cut from variable lengths of 6 to 30 in. long cuts. Illustration *A* shows a small U-groove such as might be chased in large steel castings to serve as an oil groove. Illustrations *B* and *C* show J-grooves on light and medium thickness plate, which, when opposed to each other, provide for the U-groove weld. Illustrations *D* and *E* show the J-groove provided by this process on medium and heavy thickness plate. Opposed to each other, they provide for larger U-groove welds. Illustration *F* shows the double J-groove for heavy thickness plate and the positioning of the opposing plates for the double U-groove welds.

All of illustrations *B* to *F* inclusive will serve for their respective J-groove welds. The groove contours illustrated in *B* and *C* are generally employed for plate of 1 in. thickness or less. Those contours illustrated in *D*, *E* and *F* are more often used for plate of greater thickness.

In Fig. 4 is shown a diagrammatic sketch *A* and a photographic study *B* of a cut and etched specimen of a partially completed weld in a U-groove in heavy plate. This welding was done in a flat position using straight polarity $\frac{3}{16}$- and $\frac{1}{4}$-in. diameter shielded arc electrodes. There are five layers shown. Layers Nos. 1, 2 and 3 were laid with the $\frac{3}{16}$-in. electrode and Nos. 4 and 5 with the $\frac{1}{4}$-in. size. Standard technique was employed and complete penetration and full fusion throughout the U-groove was obtained. No slag inclusions were found, although an unusually severe test condition was created by butting the specimens at their lands, instead of leaving the customary spacing.

In preparing plate edges for either U- or J-grooves, or for special conditions, the machine progressive method is employed on long lengths and where the greater precision of a mechanical operation is desired.

The work can be laid and clamped on a planer table or other comparable machine which will serve for carrying the work past the torch or vice versa.

The work can travel in a straight or rotary direction; it can be anchored and the torch mounted in the radiagraph for propelling it along the path of groove. Where the plate surface is irregular or wavy, the radiagraph is provided with a floating torch holder which will automatically follow the plate's surface irregularities, thus maintaining the dimensions and contour of the groove without attention by the operator.

At the start, if advisable, waste blocks can be used to insure a clean, properly dimensioned contour at the plate edge. The torch is mounted in its holder with the tip head held at the proper angle to the surface to assure the required depth. The preheat flames are positioned so that they touch the edge of the work. When the edge surface reaches the kindling temperature, the oxygen stream is released to provide oxidation of the metal ahead. If the radiagraph or machine tool with a torch holder is employed, it is then thrown into the forward travel.

The specimens shown in Fig. 3 *A* to *F* inclusive were prepared as above described using standard cutting apparatus with the radiagraph. Further examples of such procedure are shown in Figs 5 to 9 inclusive on these pages.

Fig. 5 shows the initial root groove of a U-groove being made in 2-in. plate. A radiagraph was employed, mounted on a track, and equipped with torch adjusting arm, 90-deg. head torch and cutting tip, all standard apparatus. The root groove was flame machined at a lineal speed of 32 in. per min. The cutting oxygen stream is controlled from an automatic shut-off supplied through a standard oxygen lance valve.

Fig. 6 shows the completed root groove and the position of the tip in relation to the work when making the cut. Note the smoothness of the cut, the regularity of the contour and the even depth of the land.

In Fig. 7 the cutting torch is beveling the side of the U-groove down to the root groove at a speed of 6 in. per min. Observe the compactness of the entire outfit.

The completed work is shown in Fig. 8, and in Fig. 9, two plates with completed grooves are opposed to each other to form the U-groove shown in Fig. 3 *E* and ready for welding as shown in Fig. 4 *A* and *B*, as previously described.

Part II of Mr. Magrath's article on flame machining will appear in an early number.

Fig. 7 — Again using the radiograph the bevel cut down to the root groove is flame machined at 6 in. per min.

Fig. 8—A close-up shows the completed root groove and bevel cut

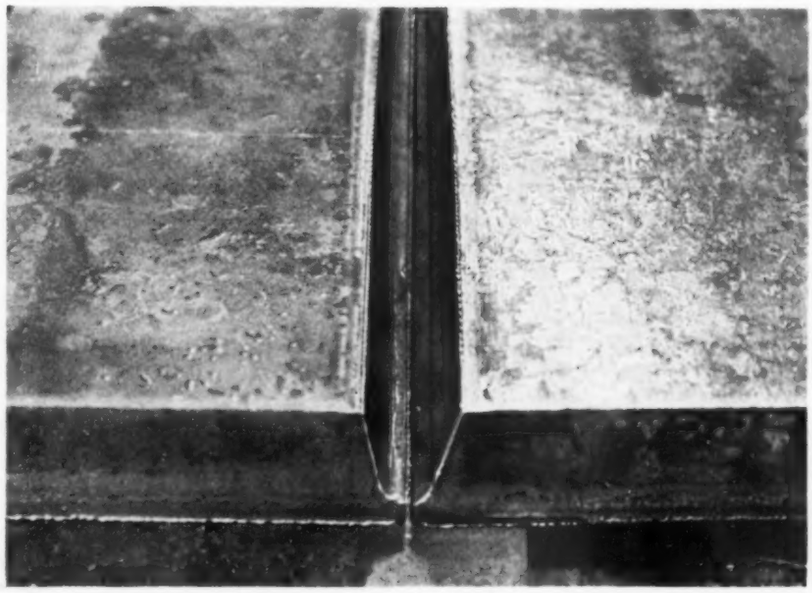


Fig. 9—Two flame-machined plates forming the complete U-groove are ready for welding by conventional methods

"Home-made" toolmakers' microscope

BY E. WILLARD PENNINGTON

A conversion job done on a contour projector widened its usefulness without sacrificing any of its original functions

A POPULAR MODEL Bausch & Lomb contour measuring projector was recognized as having the main optical requirements of a toolmakers' microscope of far greater than ordinary capacity. As there are a good number of these machines in use, a description of the relatively inexpensive "conversion" job should enable others to perform the same operation and benefit by the greatly increased flexibility and utility of the instrument. The function of contour or profile projection is not lost, because once the initial changes are made, the change-over from profile projector to toolmakers' microscope and vice versa can be made in three or four minutes. Furthermore, when functioning as a projector, the measuring functions of the instrument are greatly enhanced as a result of the incorporated changes.

Basically, the prime requisites for either a contour projector or toolmakers' microscope are the same, i. e., an optical axis and a work support movable in two directions in a plane normal to the optical axis. The Bausch & Lomb projector has for its optical system a light source, an objective lens, a projection lens or ocular, a reflecting prism and a viewing screen. Mechanically, it comprises a work support or stage of much greater size and capacity than that of the conventional toolmakers' microscope (other than those special jobs costing several thousand dollars) with two mutually perpendicular movements, or translations, of the stage through distances of about 7 x 9 in. It also has the necessary refinement of an adjustment which permits inclining the optical axis in relation to the plane of work travel, thus conforming to the helix angle of screw-threads when such work is up for examination. Additional advantages are portability, mechanical ruggedness and a design which readily facilitates the desired conversion.

When the projector is used, the light source and optical components throw a magnified shadow image of the work on the viewing or measuring screen. The movements of the work stage permit the image to be oriented and moved in relation to cross-section or index lines drawn on the viewing screen. Knowing the degree of magnification employed (for instance with 31× magnification, 0.001 in. on the work becomes $\frac{1}{32}$ in. on the shadow image and screen), measuring and comparing are readily accomplished.

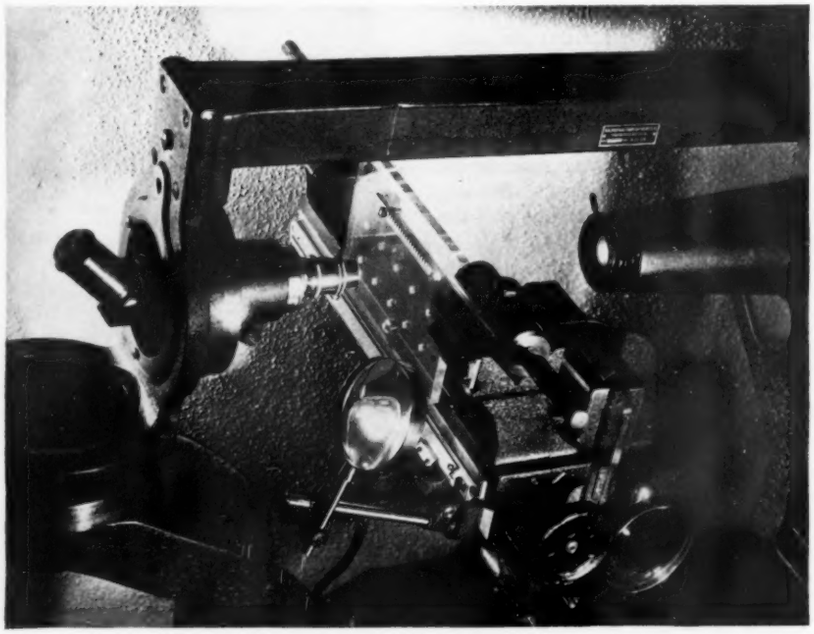
Simple Change-Over

If for the projector's horizontal projection lens or eye-piece, reflecting prism and screen, we substitute an inclined eye-piece or viewing ocular (which gives us in its field of view the magnified image of the work), and if for the measuring function of the cross-section lines on the viewing screen, we substitute a method of measuring (scale and vernier) the actual distances through which the work is moved (in relation to "cross-hairs" in the eye-piece field of view) we have a toolmakers' microscope of considerable measuring range.

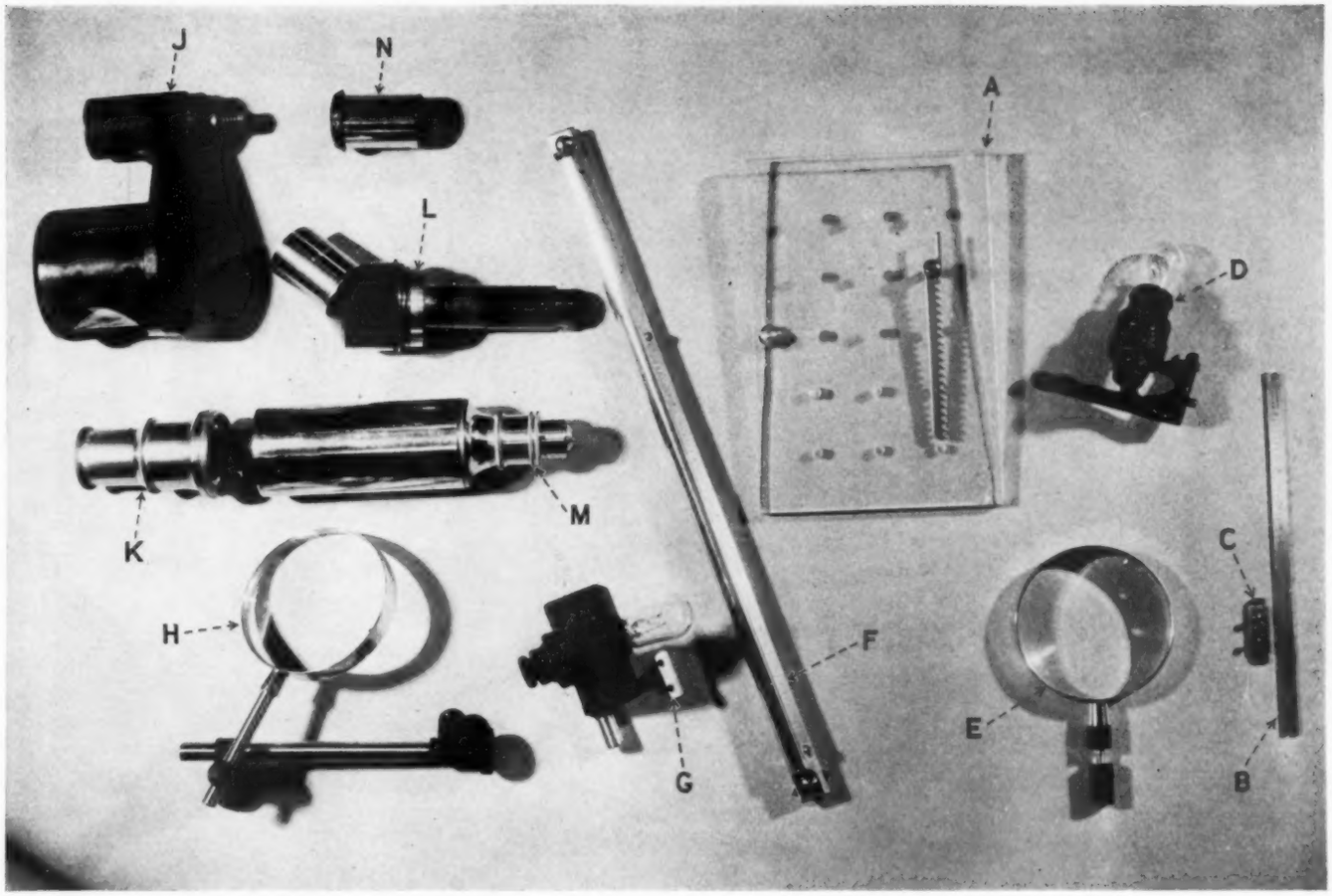
The projector as originally designed only accommodates work held between centers. It was desirable to enable both it and the toolmakers' microscope to handle flat and irregularly shaped pieces of work. Hence a stage was made, consisting of a flat $\frac{1}{4}$x4x6-in. piece of transparent Lucite, center-drilled for supporting it between the centers on the work stage and provided with a pattern of threaded holes to facilitate clamping the work. A length of rack is secured to the stage for measurement of tooth spacing. The stage is kept vertical by the law of gravity plus the little stud or boss seen at the bottom edge of the stage which bears against the edge of the dove-tail slide when the stage hangs vertically.

When in position this stage can be moved by means of the traversing screws both horizontally and vertically in a plane perpendicular to the optical axis. The amount of travel is read by means of the scales and verniers.

All standard microscope accessories,



A close-up of the converted projector shows the added parts and their proper positioning



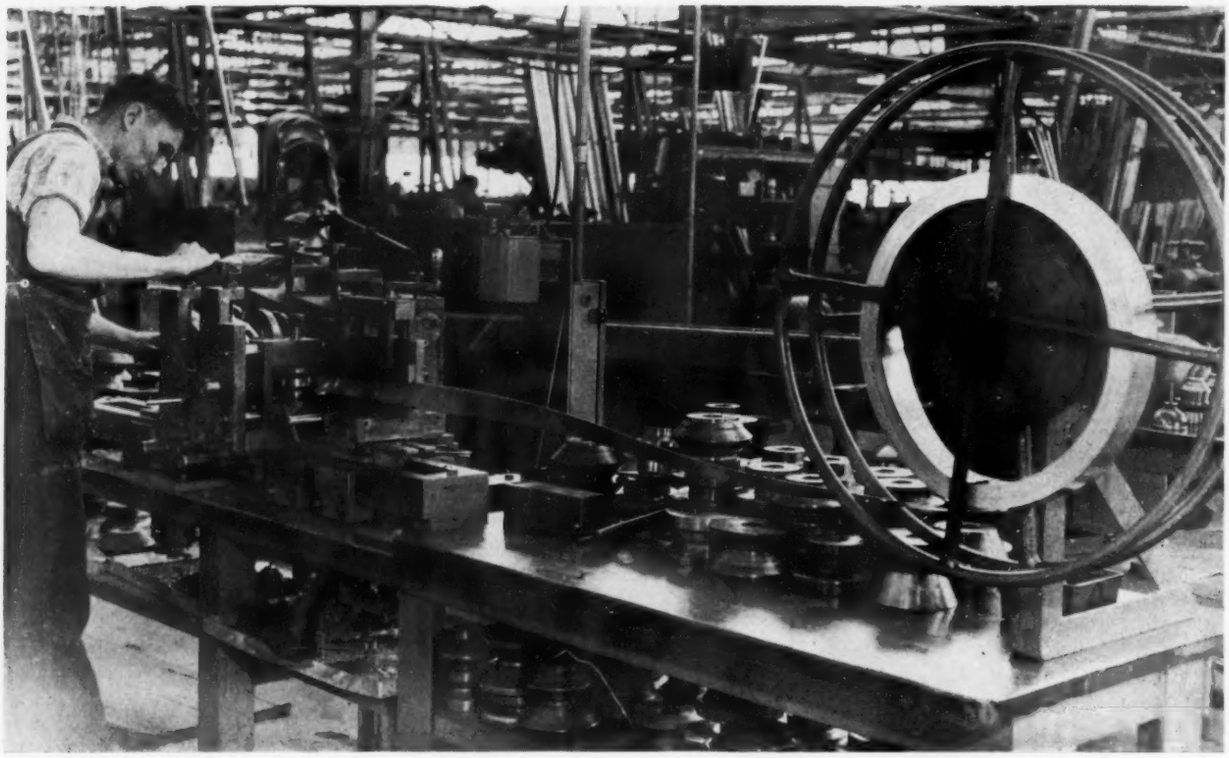
Parts involved in the change-over: stage A, *scale* B, *vernier* C, *illuminator* D, *and reading magnifier* E *for the vertical movement of the stage; scale* F, *vernier plate* G *mounted on the illuminator bracket, and reading magnifier* H *for the horizontal movement of the stage. Reflecting prism* J *is removed when the instrument is to serve as a microscope, one of the two necessary steps in changing from one function to the other. The second step consists in unscrewing the projection ocular holder* K *from the end of the microscope body and substituting the inclined eye-piece adapter* L; *Used either as a profile projector or toolmakers' microscope the magnification ratio between work and image is a result of the combination of objective lens* M *and eye-piece* N. *These few parts of the equipment can be quickly adjusted for the set-up desired*

both photographic and visual, may be employed to increase the functions or flexibility of the instrument. For instance, one of the handiest measuring devices is an eye-piece micrometer disk. This consists of a glass disk on which is engraved a scale of 40 parts, this scale appearing in the field of view when the disk is placed within the ocular. Use of a 10 × ocular and a 16-mm. objective lens results in each division of the 40-part scale being equivalent to 0.001 in. on the surface of the object being observed—a very fast method of checking small parts, as well as observing whether locations on larger work fall within the stated tolerance.

In using an eye-piece micrometer disk it is essential that the microscope body tube length (or resultant separation of ocular and objective) be precisely exact for the lenses involved. This dimension is determined by one of the most positive and pleasing tests in the field of optical measuring and employs a simple device known as a stage micrometer, i.e., a scale 0.2 in. long actually ruled in 0.001 in. This scale is ruled on a rectangle of glass about the size of a microscope slide and is protected by a cover glass. The stage micrometer is secured to the vertical stage and with the 10 × ocular and 16-mm. objective, the engraved stage micrometer scale is brought into focus when both it and the eye-piece micrometer disk scale will be seen in the field of view. If the lens separation or microscope body tube length is precisely correct, the rulings of both scales can be made to coincide throughout their superimposed lengths. Any lack of coincidence will be readily apparent and the necessary mechanical adjustment must then be made to give the proper lens separation.

The profile projector light source will be found far too bright when used for the toolmakers' microscope, hence the light intensity should be diminished to a comfortable level by filters (tinted or ground-glass disks) placed in the holder provided just ahead of the light source diaphragm. When the stage micrometer test is being conducted the light must be reduced in order to find and focus the delicate 0.001 in. graduations. Several folds of a reasonably clean handkerchief draped across the light beam will serve in a pinch.

For the job as described, all necessary optical parts (stock items) were obtained from Bausch & Lomb, and the scales and verniers from Brown and Sharpe. Design of the fittings and the balance of the work was done by the shop using the instrument—the Gopher Machine and Tool Works Company.



In the manufacture of complex structural shapes for plane construction, coiled strip stock is passed through adjustable guides and into a series of forming rolls. The rolling machines, working three shifts a day, turn out thousands of feet of light sections for stringers and reinforcements throughout the airplane

Plane parts from strip stock

BY LARRY BOEING, INSPECTOR, CONSOLIDATED AIRCRAFT CORPORATION

If roller-type dies are used properly, complex structural shapes can be rolled to shape quickly. Easy fastening and speedy production result

MACHINES OF ALL KINDS used in aircraft production work are humming with activity these days in the plant of Consolidated Aircraft Corporation. This firm recently received the largest single aircraft order in the history of American aviation, totaling $20,016,699, including an unspecified number of twin-engine patrol bombers of the PBY type for the United States Navy. (Ed. Note—Since this article was submitted a strong rumor has developed that Consolidated is being favored for a $50,000,000 order from England for patrol bombers similar to the PBY type.)

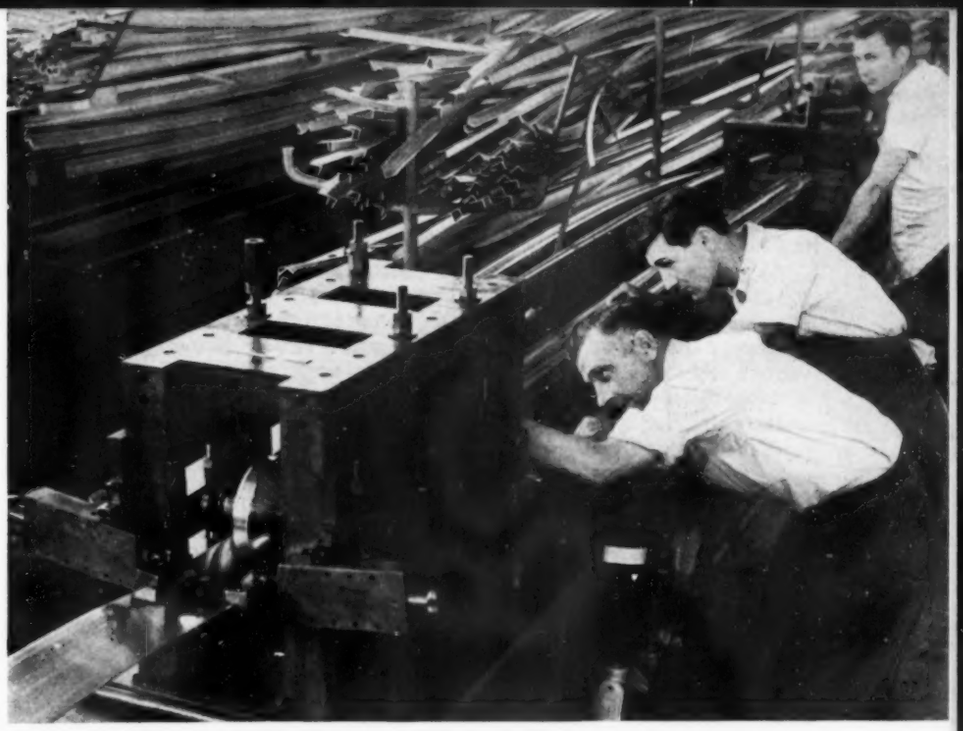
In order to facilitate production of the recent huge order for patrol-bombers, and other types of planes in production, Consolidated is now building plant extensions that will almost double the existing factory. Important additions are being made to the already extensive machine tool equipment, which has been found indispensable to large scale production of such aircraft. One of the key processes among the many employed at Consolidated, is the draw bench.

The draw-bench department is the nearest thing to large quantity production machine operation in the plant. Here many thousand feet of special light alloy structural sections are produced monthly. The department is important because a large proportion of thin-walled light alloy structural members must be used in large aircraft to attain maximum structural efficiency.

In the past, with certain aircraft designs, wide use has been made of round, square, or oval tubing, and special sections. Considerable use is also made of plain angle sections and of extruded alloy structural members. But for maximum speed and economy of production, and for ease of forming and fastening, the drawn section has been found most suitable.

By use of the drawing process, through employment of suitable rolls, it is practical to form complex sections from tin strip stock, suiting the section to the particular purpose it is

Precisely rolled sections depend on accurate adjustment of the roller-type dies. Such adjustment is here being made to form 50-ft. angle sections from 0.128 in. thick aluminum alloy



Forming and heat-treating the sections result in some distortion. They are straightened in this pneumatically operated stretching machine; the cold-working resulting therefrom increases their strength

A form jig is used to set some of the rolled sections to final shape. The adjustable blocks are set to a given contour so that sections bent in rolls to approximate shape can be worked with a rawhide hammer to the contour desired

to serve in the structure, thus promoting ease of assembly with other structural members, accessibility for riveting, painting and inspection. These parts are usually formed of Alclad, which is a strong aluminum alloy protected on each surface by a thin coating of pure aluminum. Added to other drawing and forming problems is the requirement that this protective coating must not be damaged in the forming process. These light formed sections are used in straight pieces as stringers for both wing and hull, hundreds of feet being incorporated in a single airplane for fore and aft forming in the hull, and as attachment members for the sheet-metal covering, or as attachment supports and skin stiffeners along the span of the wing. Straight drawn sections can also be formed to various contours by rolling

and other methods, and as such are used for lateral forming members throughout the flying boat hull, in engine nacelles, and at other points.

Although the draw bench at Consolidated is of standard type, the technique of using it, and the special roller-type dies used for forming the various sections required, have been developed within the department to fit the particular requirements of aircraft manufacture. Single lengths in excess of 50 ft. can be handled on the main draw bench, which is powered by a 50-hp. electric motor, and which handles material up to 0.128 in. thick in present production. In fact, not all of the work of this department is devoted to light alloy structural parts for aircraft; many special parts for tools, jigs and machine guards are drawn or rolled out of various materials including steel up to 1½x3-in. pieces rolled edgewise.

Raw material to be formed is first sheared to required widths from material of the proper alloy, sheet thickness and length. These strips come to the draw bench in rolls and may go through the large draw bench, or be processed on one of several rolling machines, depending on the size and type of shape to be formed. The sections rolled vary widely from simple right-angle bends to multiple curves including "hat" sections with short return bends at the edges to secure maximum structural rigidity. Such a section complicates the rolling process, and requires careful design of the rollers, and demands care in production. The completed sections must conform to strict dimensional requirements. Bend radii must be maintained accurately, and the finished part must not show appreciable loss in section thickness.

Rolls Carefully Designed

All forming dies are of the roll type, as is required to assure maintenance of the protective layer of pure aluminum on the strip stock. Each roller is carefully designed to impart a new shape to the ribbon of metal until it passes through the last set of rollers in finished form. Once drawn to shape the sections are ready for heat-treatment, straightening, pulling, and checking for correct hardness by means of a conventional Rockwell hardness tester.

Forming the sections, as well as heat-treating, results in some distortion of the members from true straightness. Therefore, it is necessary to pass them through a straightening operation. This also serves to work-harden the material to its maximum strength. After heat-treatment, each section to be straightened is placed on a special pneumatic draw-bench machine and pulled to just beyond its elastic limit, simultaneously straightening the section and work-hardening the material. Every section is automatically stamped along its entire length for identification purposes. This simplifies storing and final assembly. After straightening, the sections are cut into desired lengths and formed where such forming is necessary to make the part.

Forming of these light sections is done both by hand and machine. Much of the forming work is done on special rolling machines, where the perfection of the finished part depends largely on the skill and artistry of the individual operator. As a guide he uses a special master form jig; which employs adjustable form blocks and may be set for any desired form.

The operator checks his work against this master pattern and rolls the part in his machine until it has received the proper round, oval or other form.

Wide use is also made of a pneumatic forming table using standard forming bars usually of semi-circular, half-oval or similar shapes. The piece to be formed is rolled to approximate shape and is then placed on the forming, or stretching table, and the open ends of the part are clamped fast. The forming bar is pneumatically forced against the part, stretching it to proper shape. Operators usually "set" the material by hammering it with rawhide hammers. Many types of forming require a certain amount of hand hammering with a rawhide hammer to bring the part to the required shape, but the basic work throughout is done by machine.

This machine stretches a nearly formed angle or other section around a form of the exact final shape. While it is being stretched, a few blows around the edge of the section sets it so that when the stretching force is relieved the work retains the desired shape

Many Miscellaneous Parts

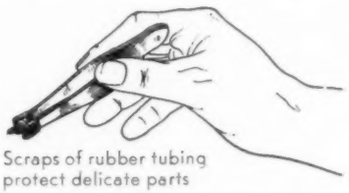
Total monthly production of the draw-bench department runs to many thousands of feet of aluminum alloy material. However, this does not adequately express the importance of the department since much of its work is devoted to the forming of miscellaneous parts that are widely used for tooling and jigging purposes. Also, much of the work of the department is devoted to forming these sections after they are rolled or drawn to shape. Other functions, such as rolling engine mount tubes to shape, are also performed in the department. And out of these draw benches and rolling machines come the various parts, straight or formed, that are so widely usesd as ribs, framework, and stiffening members under the skin of the giant birds which patrol America's sea lanes.

SHORT CUTS FOR THE SMALL SHOP

BY A. H. WAYCHOFF

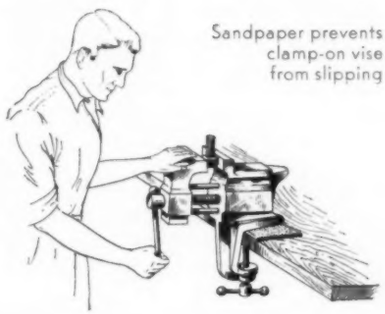
Hook bolts clamp work on drill table

DRILL PRESS owners will find that two or three little hook bolts of the type shown will always prove helpful in holding work on the press table. Just take some bolts of suitable length, saw off the heads, and bend about an inch down at right angles. Then file off the bottom of the angle till it's flat and square. The bolts should be fitted with a nut and washer, and ought to have pretty long threads to fit various thicknesses of work.



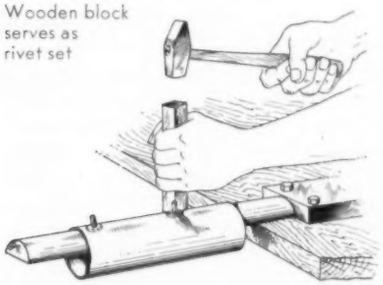
Scraps of rubber tubing protect delicate parts

WHEN HANDLING delicate parts with tweezers you can always play safe and be sure not to damage them by putting little lengths of rubber tubing on the points. The rubber will hold any tiny part firmly, yet with little danger of breakage.



Sandpaper prevents clamp-on vise from slipping

SMALL VISES which are held to the edge of the bench by a clamp often cause lots of annoyance by working loose just when you want them to hold tightest. This can be prevented by taking a piece of sandpaper and folding it with the gritty side out, then placing it under the base plate of the vise before clamping it down. That way it stays a lot firmer, and you don't have to twist the clamp so tight, running the risk of springing or breaking part of the vise.

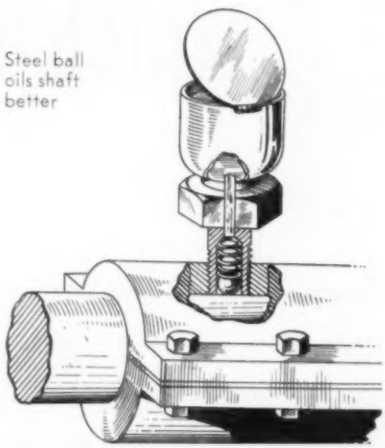


Wooden block serves as rivet set

MANY JOBS come up where it's necessary to use common tinners' rivets. A tinner using these rivets, of course, lays the rivet head down on a mandrel under the work and then, using his set, drives down and the rivet end is drawn up through the material ready for heading. But sometimes you're caught without one of these tools. One mechanic gets around it by using a stick of hardwood for a rivet set. Any hard wood will do. A stick an inch square is good for about a dozen rivets, and then sawing a little off the end makes it good for a dozen more. That way one stick will handle a sizable job.

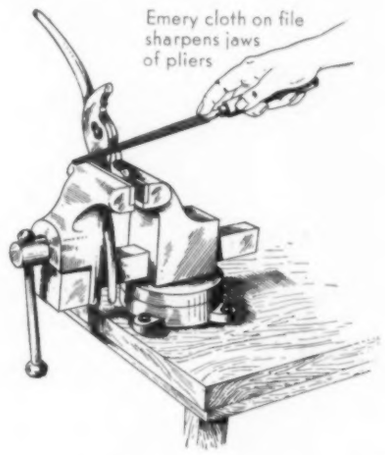
Belt dressing holder promotes safety

SAFETY is often sacrificed when applying dressing to wide belts. At least one plant has had a fatality caused by workmen's jacket sleeves getting caught in the belt. It prevents this from happening again by using the dressing holder shown. It's just a sort of paddle with a hole in it to take standard sized sticks of belt dressing. A saw cut is made several inches up the handle, and a hole cross bored and fitted with a bolt and wing nut. It takes only a second to slip the dressing down as it is used, and the device makes it possible to apply the dressing without any danger of getting caught.



Steel ball oils shaft better

LUBRICATION of plain bearings can sometimes be improved by this trick. Drill out the oil feed hole for about half its length, from the bottom. Then slip in a small spring and a bearing ball just big enough to make a snug fit in the hole. The ball rides on the shaft, and the spring makes up for any irregularities as the shaft turns. It will slowly but steadily feed oil onto the shaft, doing away with frequent filling of the cup and flooding of the bearing, as well as eliminating the nuisance of having oil run all over the machine. It will cut down the oil used, and will provide better lubrication too.



Emery cloth on file sharpens jaws of pliers

SIDE CUTTING PLIERS could easily be sharpened with a common small file if the cutting edges weren't so hard a file won't cut them. A little strip of emery or carborundum cloth glued to one side of the file will make this job an easy one, though. In case using a small file isn't convenient, a little strip of any strap iron or steel will do.

DIE DESIGN FOR LOW MAINTENANCE—No. 2

Which stripper mechanism?

BY JOSEPH I. KARASH, RELIANCE ELECTRIC & ENGINEERING COMPANY

Strippers are designed to save time before and after regrinding operations. The examples shown have proved worthwhile

SOME FORM of stripper is usually required on blanking and piercing dies. Before determining which type of stripping mechanism to use in a given instance, it is necessary to come to a definite decision regarding the use of guide posts.

The examples of stripper designs described in this discussion have been found advantageous from the standpoint of die maintenance. Each mechanism shown illustrates a basic design which decreases the amount of effort required to dismantle the die for grinding.

Stationary Stripper Plates

One of the simplest methods of stripping is to use stationary plates like those shown in Figs. 4, 5 and 6. With this type of stripper, the plate is mounted between the punch and die in a fixed relation to the die block. An opening conforming to the shape of the punch and machined in the stripper plate permits the punch to pass through the plate and enter the die block. Work is placed between the stripper plate and the die, and as the ram descends, the punch fractures the work, forcing the slug down through the die block. The outer stock, in the meantime, is forced up onto the punch. When the ram is raised, the stationary stripper plate prevents the stock from rising with the punch.

From the standpoint of die maintenance cost, the stationary stripper plate has the following potential advantages:

1. It is simple in design. There are no moving parts, stripper bolts, knockout pins or similar parts which might require adjustment.
2. The stationary stripper plate does not prevent the punch from entering the die; consequently, the method in itself does not necessitate guide posts for setting up.
3. Where the stripper plate is secured directly to the die block, no adjustment is required to compensate for wear as the die is ground down.
4. When using interchangeable punches and dies it is possible to dismantle the stripping mechanism and remove the punches and dies for sharpening. This can be done without removing the die set from the punch press.

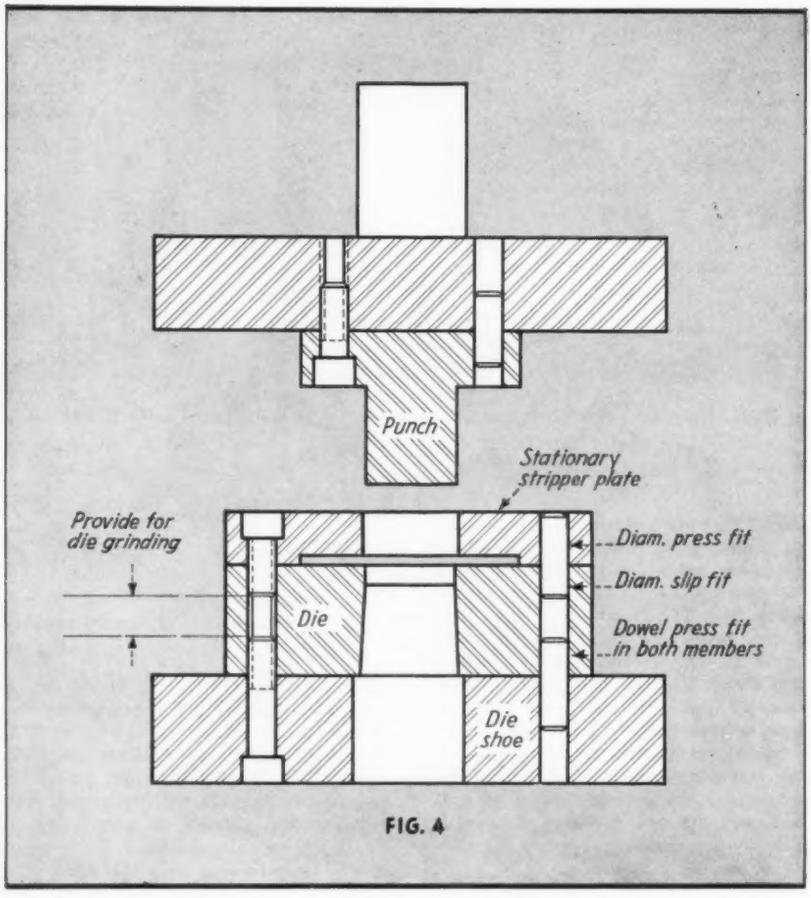


FIG. 4

Fig. 4—No adjustment for die wear is required when using a stationary stripper plate for this type; slip fit of dowels makes it easy to get at the die for grinding

Follow Die Strippers

The type of stationary stripper plate generally used for strip stock or follow-die operation is shown in

Fig. 4. This stripper plate is made of one piece and is machined to fit the work so that the plate itself may act as a stock guide.

In the design shown, it is the method of securing the stripper plate to the die block that is of interest. Holes in the die block pass through, allowing screws and dowels to enter from both sides. The screws entered from the top secure the stripper plate to the die block, while those entering from the bottom secure the die block to the die shoe. Ample clearance should be provided between the upper and lower screws, so that the screws do not meet as the die is ground down.

When using this type of design, the stripper plate can be removed without removing the die block from the shoe. It would be poor practice to attempt to secure both the stripper plate and the die block to the shoe with the same screws, as this would necessitate the dismantling of the entire die every time the stripper plate is removed.

The connecting dowels are tight in the stripper plate, but have a slip fit in the die block. This greatly simplifies the removal of the plate. If the dowels were tight in both members it would not only require force to remove the stripper plate, but the dowels might be left in the die block, from which they would have to be removed. Although the stripper plate is removed every time the die is ground, no adjustment for die wear is required because the stripper plate is secured directly to the die face.

Overhung Stripper Plates

A type of stationary stripper plate generally used for unit stock operation is shown in Fig. 5. This design is advantageous when punching holes fairly close to one edge of comparatively large stock. On work of this type it would not be practical to attempt to straddle the sheet with the type of plate shown in Fig. 4.

The stripper plate shown in Fig. 5 is machined to overhang the work and, at the same time, to act as a stop for positioning the material. Also shown is an alternative method of securing the stripper plate to the die block. Machine screws are used instead of screws and dowels. The fit of the head in the countersunk hole accurately locates the stripper plate without the use of dowels.

Fig. 5—Overhung stripper plate is useful for punching holes near the edge of a strip, it can be removed readily for die sharpening

Fig. 6—Bridge type stripper plate, used for punching holes in the center of large pieces, is fastened to the die shoe. Spacers must be shortened occasionally to compensate for grinding down of die

Bridge-Type Strippers

Shown in Fig. 6 is the bridge type of stationary stripper plate. This type generally is used when punching holes in the center of comparatively large work. The stripper plate is secured to the die shoe instead of the die block. Consequently, the spacers supporting the stripper plate should occasionally be shortened to compensate for grinding down the die block when sharpening. This type generally is used only to provide stripping action, some independent method being used to locate the work.

One of the factors which makes guide posts necessary for setting up is that in some cases the stripping mechanism prevents the punch from entering the die. An example of such a condition was shown in Fig. 1 (*AM*—Vol. 84, page 423), where the stripping is accomplished by springs which are compressed as the punch enters the die. However, since the stripper plate is flush with the die in a normal condition, these springs are preloaded to insure stripping.

Because of the required preloading, an offhand impression would be that elastic strippers would always make guide posts a necessity. There is a simple fundamental design principle which makes it practical to use elastic strippers without guide posts. This is to design the die set so that the elastic member is easily removable. Several examples of this type of design are shown.

Removable Elastic Strippers

A simple application of the removable laminated rubber stripper is shown in Fig. 7. After the punch and die have been set up for the first time, a series of scrap rubber washers are punched and allowed to remain on the punch body. As the punch enters the die, the washers on the punch are compressed. As the punch leaves the die, the elasticity of the rubber will strip the work from the punch. Best results will be obtained by using the thickest rubber that can be pierced. The advantage of this is that the last washer will project ahead of the edge of the punch and will be preloaded before the punch actually enters into the die.

It generally will be found that

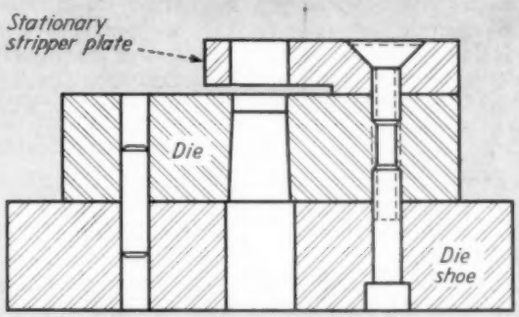


FIG. 5

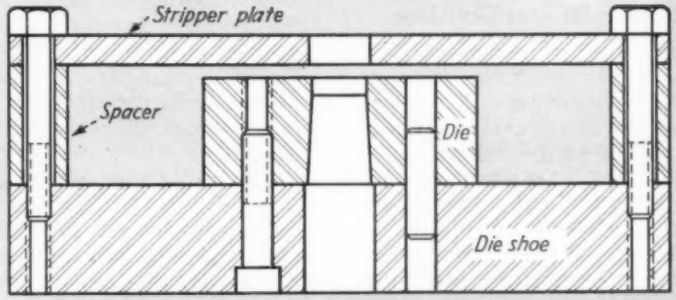


FIG. 6

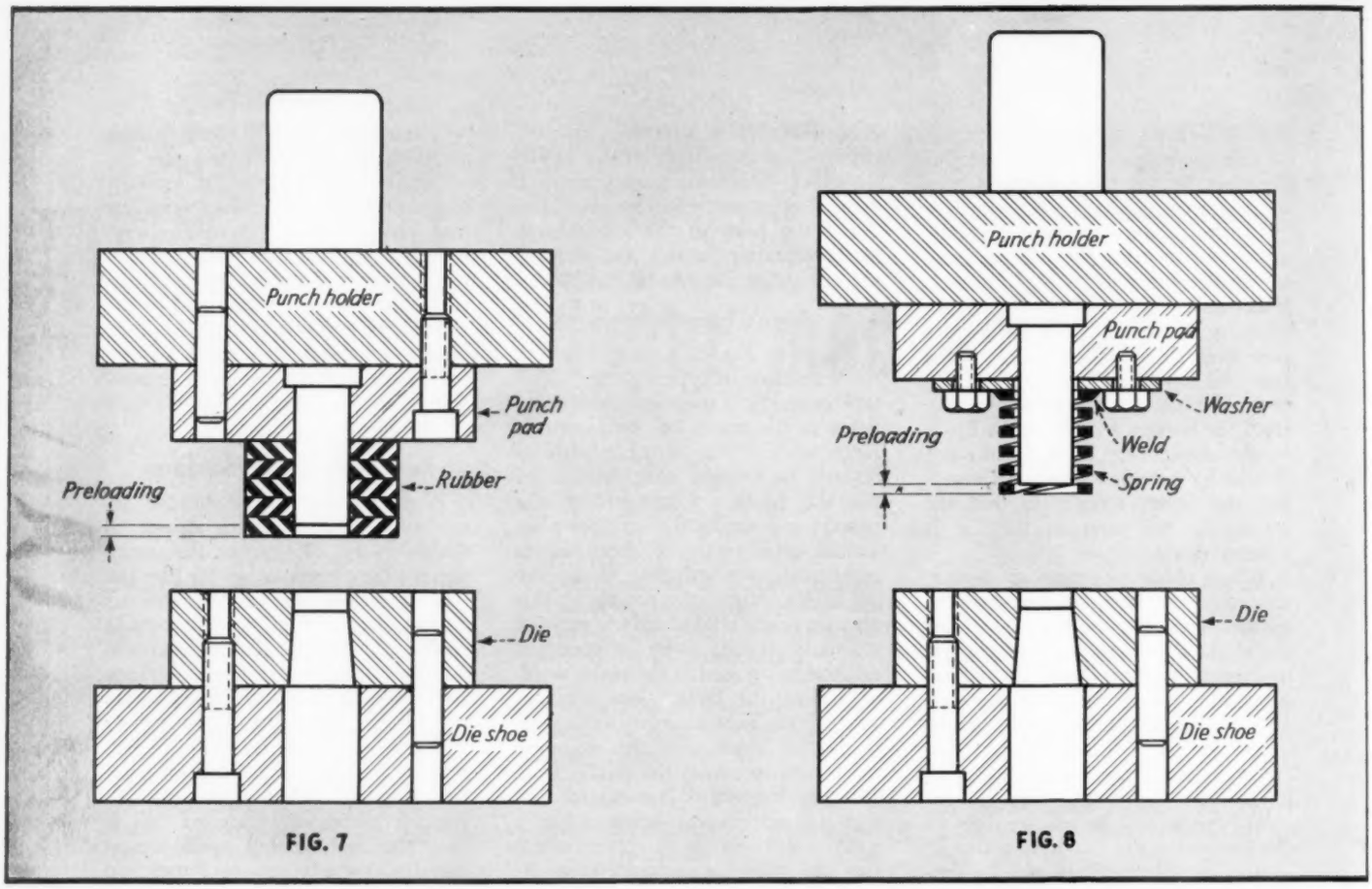


Fig. 7—A punch and die of this type can be set up without guide posts by removing rubber stripper and using punch and die for alignment purposes. Fig. 8—By removing washer and stripper spring, this design is ready for grinding, it can be reset without use of guide posts

there is too much "give" to a stripper composed entirely of rubber washers. This can be overcome by using a foundation of some non-elastic material, such as cardboard or fibre, in order to cut down the length of the rubber column. In order to set up such a punch and die without guide posts, it is necessary only to peel off a rubber washer to allow the punch and die to engage.

The laminated rubber stripper also is advantageous from the standpoint of die maintenance cost, because it is necessary only to peel off and replace a rubber washer when grinding the punch.

Rubber Stripper Cost Low

An incidental advantage of the laminated rubber stripper is the obvious low initial cost. It would be difficult to conceive of a stripping arrangement which could be made at a lower cost. The initial cost advantage would be much more apparent if the punch were irregular in contour, since the fitting of a stripper plate to a punch of irregular outline is comparatively expensive.

The laminated rubber stripper has the limitation of being practical only on light gage work. Should an attempt be made to use this method for stripping heavy material, it generally will be found that it is not practical to obtain the necessary preloading to insure stripping.

Removable Spring Strippers

Another example of a removable stripper is shown in Fig. 8. This stripping device is simply a spring and a metal washer secured together with a few spots of welding. Screws are provided so that the washer can be secured to the punch holder. The assembly view shows how the stripping mechanism quickly can be dismantled and replaced.

By removing the stripping device, the punch can be entered into the die and set up in the press without the use of guide posts. After securing the die-set in the press, the stripper is slipped onto the punch and secured in place.

The spring should be longer than the punch so that sufficient preloading is obtained to insure stripping. As the punch is ground down it is not always necessary to decrease the length of the spring because the increased spring preloading may not be objectionable.

In addition to the maintenance advantages, the above stripping scheme has the advantage of low initial cost. This is an important point in the event that the punch and die are to be used for a limited amount of work. This type of stripping is limited to small punches which can be inclosed in the spring used for stripping.

Removable Sleeve Strippers

Another form of removable stripper, the sleeve type, is shown in Fig. 9. The mechanism is essentially a sleeve secured to a cross-bar passing through the punch holder. The sleeve and cross-bar are free to slide up and down on the punch, the travel being limited only by the length of the punch holder slot. A light spring is provided under the cross-bar so that there is a slight upward pressure exerted by the sleeve, thus preventing the stripper springs from falling out. To remove the stripper springs it is necessary only to grasp the sleeve and pull downward, thus freeing the springs so that they can be removed. After removing the stripper springs and releasing the sleeve, the punch holder will appear as at *A* in Fig. 9.

The punch can then be entered into the die for setting up without

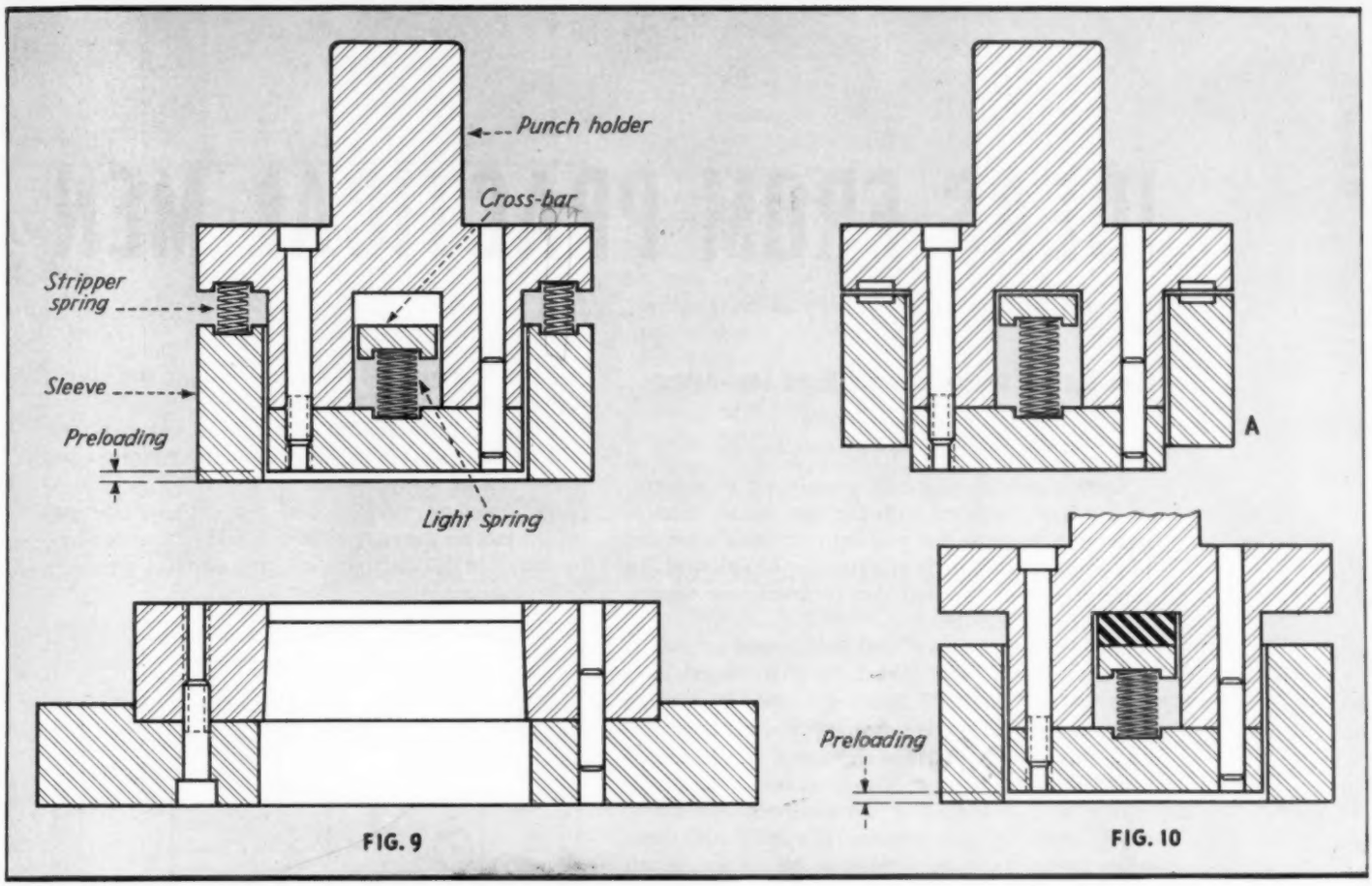


Fig. 9—Another form of stripper has an easily removable spring, thus eliminating necessity for dismantling all parts for sharpening. Fig. 10—This design is similar to Fig. 9, except that a rubber block is used to provide the stripping force. A thick block is used to provide preloading of stripper

guide posts. After completing the set-up, the stripper springs are replaced and the die is ready.

The retracted position of the sleeve as shown in Fig. 10, also eliminates the necessity of dismantling or reassembly for sharpening. It should not always be necessary to grind the stripper to compensate for die wear, since the difference in length can be taken up by increased preloading.

In designing a punch holder of this type, the screws holding the punch should be entered from the top, otherwise the screw heads would be ground off as the punch is sharpened.

In Fig. 10 is shown a design of punch holder identical to that shown in Fig. 9, except that the stripping force is provided by a rubber block instead of springs. The rubber block is slipped in behind the cross-bar and kept from falling out by the slight upward pressure of the spring under the cross-bar. A rubber block should be used which is thick enough to cause the sleeve to project ahead of the punch, so that preloading is obtained.

Part 3 of Mr. Karash's series will appear in an early number.

Without Winking

By ED WEST

LIFE BEGAN at 50 for the "electric eye." The first photo-electric cells were developed some 60 years ago, but only in the past few years have their practical production value for the metal-working shop been realized. Operating with split-second speeds and without the variables of the human eye the photo-electric cell and electronic controls have recently been perfected to determine the proper time of "blowing" a Bessemer converter. In another device banks of tubes scan sheet steel running at 1,000 ft. per min. and operate controls to mark holes in the sheet.

One of the simplest uses in the machine shop is that of safety curtains for presses. The installation operates similarly to the device which opens railway station doors for you. By using a series of photo-cells one above the other these safety curtains can be made any height to suit the stroke of the press. The "eye" detects and reads temperatures. By connecting them with proper controls an accurate long-range temperature reading device is made available for many heat-treating and metal-working operations.

Even more elaborate uses have been made of these devices in inspection tools. For example, Ford has an inspection device which selects, gages and sorts all parts automatically at a rapid rate.

While the controls themselves are comparatively inexpensive many of the applications in which they are used may be quite expensive. It is easy to say, "Let us make an inspection device using photo-electric cells." However, when the job has been completed it will be discovered that some $2,000 has been spent for electronic controls and another $18,000 has been spent for the mechanical machine to do the inspection job.

There is one grain of comfort in this for those of us who occasionally stagger in from the monthly meeting of our favorite society. If these devices were too cheap, there might come a day when friend wife installs a photo-electric control which will automatically ring a loud bell when we quietly navigate through the door.

IDEAS FROM PRACTICAL MEN

High Cutting Speeds Demand Rigid Tool Holders

By TOM ADDISON
Engineer, Cincinnati Planer Company

Cutting tools must be held securely and all elements in any way connected with the tool holder must in turn be so designed that play between parts is reduced to a minimum. This is to eliminate vibration of the cutting edge of the tool due to insufficient support near the cutting edge.

Fig. 1 shows a type of tool holder used on planers for many years. The tool block *S* is hinged on a taper pin *T*. The total thrust developed by the cutting action of the tool is resisted only by the taper pin. This thrust produces shearing action at sections *A* and *B* of the pivot pin.

Any play developed at the taper-pin bearing by heavy roughing cuts remains practically the same when finishing cuts are performed and allows the cutting edge of the tool to wander up and down producing wavy surfaces or chatter marks. To overcome this shearing action and strain on the pivot or taper pin an abutment should be provided. This abutment *A*, shown in Fig. 2, is cast solid with the clapper box and has a slightly tapered surface.

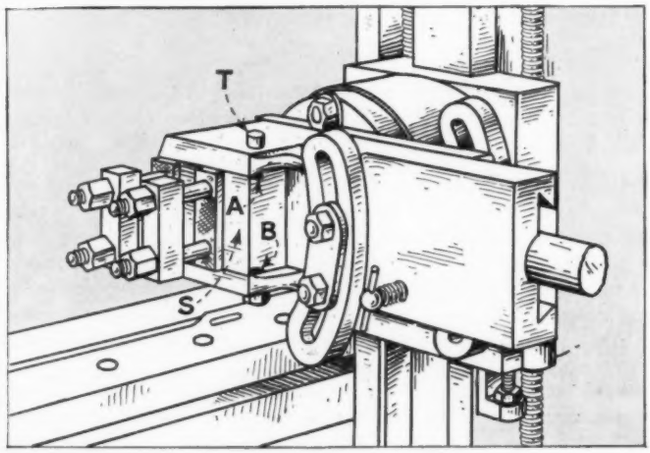


Fig. 1—In old-style tool holders the block is hinged around a taper pin which takes the total thrust of the cutting action of the tool

This tapered surface is scraped to an accurate fit with the corresponding taper at the top of the tool block and both parts are clamped tightly together at these tapered surfaces when boring and reaming the taper pin hole, assuring contact at this location at all times. With this construction, cutting capacity has been greatly increased while at the same time giving the tool-holding elements longer life. It also eliminates vibration and chatter marks.

Fillets indicated in the plan view in Fig 2 further aid the clapper box in resisting side pressures encountered in many operations.

It is well to mention here that automatic lifting of the tool on the return stroke is being requested frequently. In this country this lifting action is generally obtained either pneumatically or by the aid of a solenoid. Mechanical attachments for this purpose seem to be in favor in Europe. Wear and tear on the tool and its holding elements are reduced to a minimum when using a machine equipped with this lifting feature.

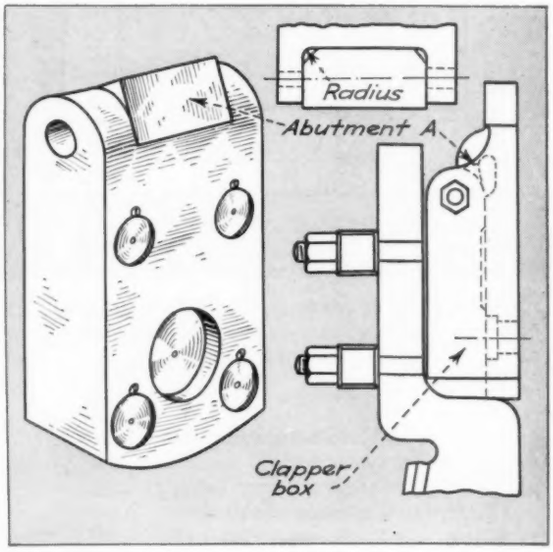
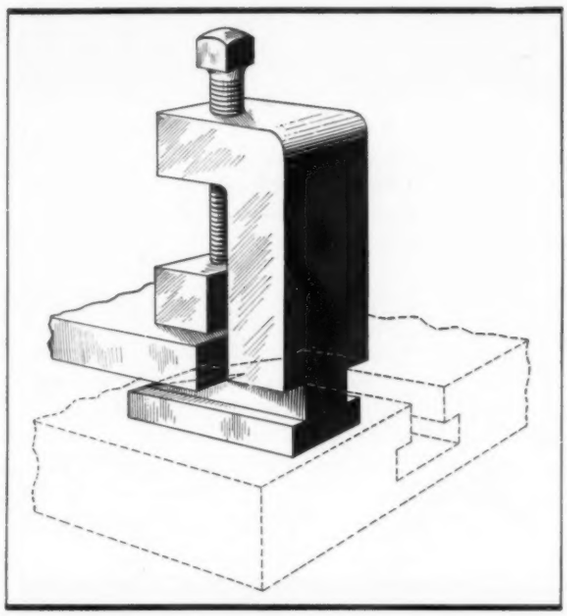


Fig. 2—The shearing action and strain on the pivot in a tool holder can be overcome by an abutment cast solid with the clapper box. This construction increases the life of the tool-holding element, eliminates vibration, and improves cutting accuracy

Clamps that Hold Work Solidly on Machine Beds

By WILLIAM ANDERSON

Several months ago we designed the illustrated clamps which have tongues to fit the T slot in machine beds. It has eliminated the use of different sizes of bolts and blocking for holding work to be machined on planers, shapers, drill presses, and vertical boring mills. The clamping screw is set directly on the work in some instances, while in others



These clamps with tongues to fit T slots in machine beds grip the work solidly and will not slip even on the heaviest cuts

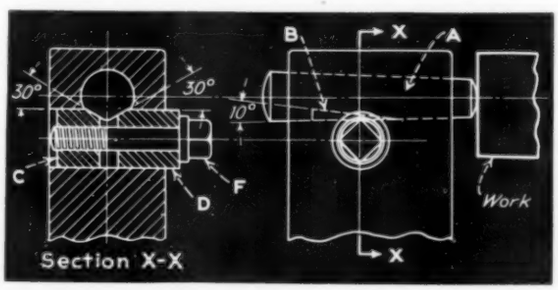
a packing piece is used as shown in the drawing to increase the grip of the screw on the work. We have found that the clamps will not slip even on the heaviest of cuts. The clamps are used in pairs, two pairs covering most types of flat work.

Locking Arrangement for Work Supports

By DONALD A. BAKER

Heavy machining operations on rough or irregular surfaces frequently requires one or more supports that can be adjusted either by hand or by spring pressure, and which can be securely locked. Herewith is a sketch of such a device for use where the cuts are heavy or where chatter is likely to develop.

The support *A* is a sliding fit in the body of the fixture and is partly cut away at *B* at an angle of 10 deg., the sides of the cut-away portion being at an angle of 30 deg. each. A hole at a right angle to that in which the support slides contains the nut *C* and the collar *D*, both of which have 30-deg. flats to match the angles on the sides of the cut-away portion of the support. The nut and the collar are drawn together by the collar-head screw *F*, thus pinching the support between them and locking it securely. Due to the 10-deg. angle at which the support is cut away, the greater the end pressure, the more securely it is locked against the work.



Due to the angle at which part of the support is cut away, the greater the end pressure on it the more securely it is locked

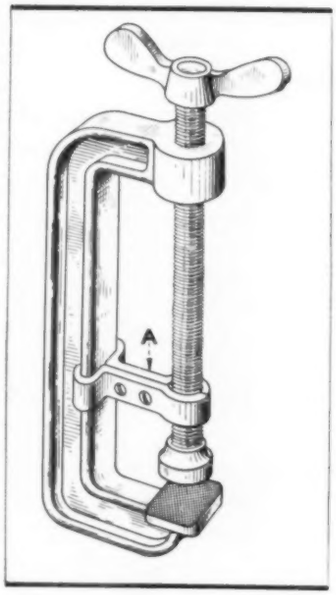
While the arrangement illustrated is for hand adjustment of the support, it is a simple matter to put a spring behind it to bring it into contact with the work and hold it while it is being locked. This is especially helpful where several supports are used.

Use This Support for Long Clamp Screws

By CHARLES H. WILLEY

Superintendent of Manufacturing
Hoyt Electrical Instrument Works

Machinists and other mechanics who use C-clamps will recognize the value of the simple screw support *A* which the writer has applied to his C-clamp to prevent deflection of the screw when the clamp is used in its extreme closed position, due to the necessary clearance of the screw in the tapped hole. The support is made in two parts from $\frac{1}{8}$x$\frac{5}{8}$-in. cold-rolled steel and is assembled in place by two machine screws. By slackening the screws, the support can be slid to any required position on the clamp. The screw has a slip fit in the body of the support.

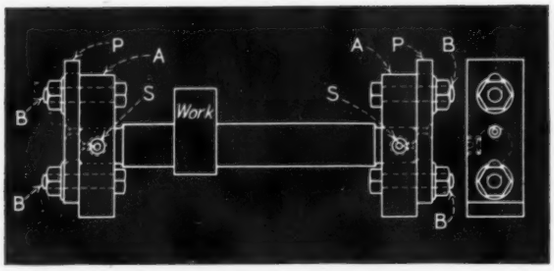


Offset Blocks Used for Finishing Eccentrics

By MARTIN H. BALL

The offset blocks shown in the drawing are used on standard arbors for turning an eccentric outside diameter on work that has been bored previously. The work is locked on the arbor by a force fit if the turning or grinding to be done is light; otherwise, it is locked by set screws or a key. An offset block is placed on each end of the arbor, fitting the reduced ends of the arbor.

These offset heads are made with bases *A* and sliding plates *P* held together by clamping bolts *B*. Both bases *A* and sliding plates *P* are ground finished, and are equal in length and width. The bore for the arbor and countersunk holes for the centers are made central with the ends and sides of the blocks and plates; therefore, the amount of offset



These offset blocks can be used on standard arbors for turning eccentric outside diameters on work that has been bored previously

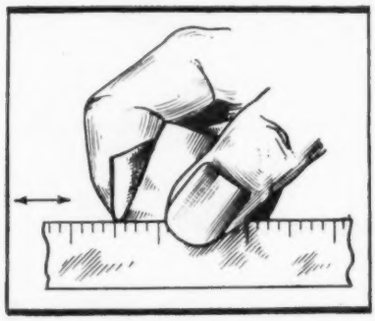
required can be obtained easily by the use of thickness blocks and thickness gages. The set-up for the offset as well as the location of the blocks on the arbor should be made on a surface plate.

The complete unit can then be placed on centers and driven with a driver placed against the block on the headstock end of the lathe or grinder.

Harmless Cleaning of Steel Scales

By L. F. SOUTHWICK

For cleaning steel scales, No. 40 alundum cloth will zip accumulated corrosion and discoloration from them very quickly. But care should be taken not to rub too hard close to the edges or the graduations will be ground away there more than elsewhere. Abrasive cloth laid flat on a semi-hard surface, such as a piece of blotting paper laid on a surface plate, will do no harm to the scale when it is rubbed on it. To clean the edges of the scale, fold a piece of abrasive cloth and hold it between the thumb and index finger as shown in the illustration so that the fold is in contact with the edge. Rubbing the fold along the edge will clean it without dulling the sharp corners. If the scale has pitted spots that the abrasive cloth will not remove, a glass eraser will do a good job. Such an eraser has a propellable bundle of glass fibers in a metal tube.



Corrosion can be removed from the edges of scales by rubbing them with a piece of folded abrasive cloth held between the thumb and the index finger

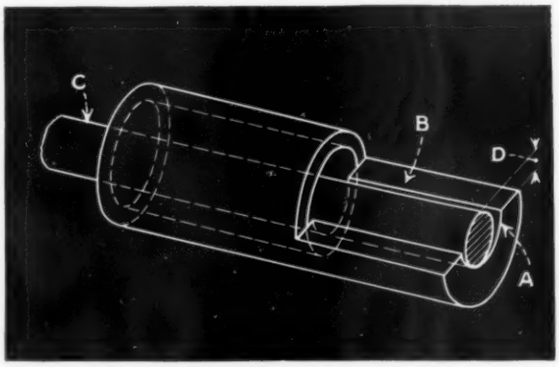
Measuring the Radius of a Half-Bore

By GEORGE BELBES

Two methods of measuring cut-away bores, such as shown at *A* in the drawing, are suggested herewith.

First Method. The spindle is turned until the half-bore is uppermost. By means of a vernier and indicator, the faces *B* of the cut-away bore are brought into perfect horizontal alignment and the vernier reading noted. With the part in this position, a rod *C* of convenient size and known diameter is inserted into the bore and an indicator or vernier reading is taken on the top of the rod at The difference in height *D* between the faces of the half-bore and the top of the rod subtracted from the diameter of the rod will give the radius of the cut-away bore.

Second Method. In this method, the spindle is again turned until the half-bore is uppermost. By means of a vernier and indicator, align the faces *B* of the half-bore until they are in alignment, that is, until the indicator reading is the same. After noting the indicator reading, lower the indicator directly into the half-bore. Move it about until the lowest point of the bore is found and again note the reading. The difference in the two readings will be the depth of the half-bore. If the indicator is held fixedly



The radii of half-bores can be measured by placing a rod of known diameter in the half-bore and determining the distance by an indicator between the top of the rod and the horizontal surfaces of the cut-away portion

in position and the spindle is rotated sufficiently to obtain an indicator reading throughout the periphery of the half-bore, any fluctuation shown on the indicator will be a measure of the eccentricity or ellipticity of the half-bore.

If a vernier reading is taken at the lowest point of the half-bore, and the indicator is moved an amount equal to the difference of the radii of the half-bore and any other bore, respectively, then when the indicator is introduced into the lowest point of such other bore, the relative size and concentricity of these radii will be measured.

These methods of measuring the radii of half-bores are more convenient that the one described by H. Moore (*AM*—Vol. 83, page 919). While Mr. Moore's method is suitable for the purpose for which it was designed, it does not really measure the radius of the half-bore, but rather the depth of the cut-away hole. Neither will it measure the eccentricity of the bore, nor check the concentricity of the half-bore with other bore on the same part. These faults are overcome by using the methods herein described.

Involute-Spline Standards—II

Courtesy of the American Standards Association

THESE STANDARDS for side-bearing involute spline are intended to serve as a basis for the design of interchangeable spline shafts and fittings. They were developed by the Sectional Committee on the Standardization of Small Tools and Machine Tool Elements, which is sponsored by the National Machine Tool Builders' Association, the S.A.E. and the A.S.M.E. More or less deviation from the standard will be necessary

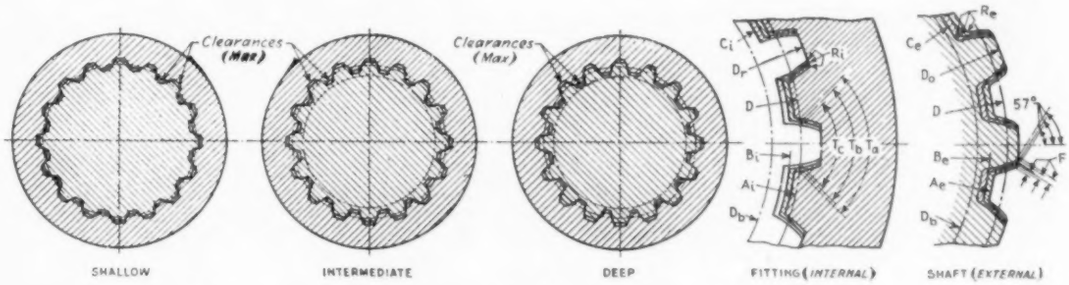


Table 5 Dimensions of 30 Deg Involute Splines With 16 Teeth—Fitting (Internal)

Corresponding Ball or Roller Bearing Bores		Pitch Diameter	Diametral Pitch	Base Diameter	Root Diameter		Inside Diameters						Radius or Broach Chamfer		Circular Width of Space at the Pitch Line		
							Shallow		Intermediate		Deep				Shallow	Intermediate	Deep
				D	D_r		A_i		B_i		C_i		R_i		T_a	T_b	T_c
					1.085D	1.070D	0.980D	0.979D	0.950D	0.949D	0.920D	0.919D	0.0233D	Nil			
Bearing Number	Bore in Mm	D		D × 0.8660254	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	D × 0.107024	D × 0.098175	D × 0.089715
04	20	0 7500	21 3333	0 64952	0 814	0 803	0 735	0 734	0 713	0 712	0 690	0 689	0 017	0 000	0 0803	0 0736	0 0673
05	25	0 9375	17 0667	0 81190	1 017	1 003	0 919	0 918	0 891	0 890	0 863	0 862	0 022	0 000	0 1003	0 0920	0 0841
06	30	1 1250	14 2222	0 97428	1 221	1 204	1 102	1 101	1 069	1 068	1 035	1 034	0 026	0 000	0 1204	0 1104	0 1009
07	35	1 3125	12 1905	1 13666	1 424	1 404	1 286	1 285	1 247	1 246	1 207	1 206	0 031	0 000	0 1405	0 1289	0 1178
08	40	1 5000	10 6667	1 29904	1 628	1 605	1 470	1 469	1 425	1 424	1 380	1 379	0 035	0 000	0 1605	0 1473	0 1346
09	45	1 6875	9 4815	1 46142	1 831	1 805	1 654	1 652	1 603	1 601	1 553	1 551	0 039	0 000	0 1806	0 1657	0 1514
10	50	1 8750	8 5333	1 62380	2 034	2 006	1 838	1 836	1 781	1 779	1 725	1 723	0 044	0 000	0 2007	0 1841	0 1682
11	55	2 0625	7 7576	1 78618	2 238	2 207	2 021	2 019	1 959	1 957	1 897	1 895	0 018	0 000	0 2207	0 2025	0 1850
12	60	2 2500	7 1111	1 94856	2 441	2 408	2 205	2 203	2 137	2 135	2 070	2 068	0 052	0 000	0 2408	0 2209	0 2019
13	65	2 4375	6 5641	2 11094	2 645	2 608	2 389	2 386	2 316	2 313	2 243	2 240	0 057	0 000	0 2609	0 2393	0 2187
14	70	2 6250	6 0952	2 27332	2 848	2 809	2 573	2 570	2 494	2 491	2 415	2 412	0 061	0 000	0 2809	0 2577	0 2355
15	75	2 8125	5 6889	2 43570	3 052	3 009	2 756	2 753	2 672	2 669	2 588	2 585	0 065	0 000	0 3010	0 2761	0 2523
16	80	3 0000	5 3333	2 59808	3 255	3 210	2 940	2 937	2 850	2 847	2 760	2 757	0 070	0 000	0 3211	0 2945	0 2691
17	85	3 1875	5 0196	2 76046	3 458	3 410	3 124	3 121	3 028	3 025	2 932	2 929	0 074	0 000	0 3411	0 3129	0 2860
18	90	3 3750	4 7407	2 92284	3 662	3 611	3 308	3 304	3 206	3 203	3 105	3 101	0 079	0 000	0 3612	0 3313	0 3028
19	95	3 5625	4 4912	3 08522	3 865	3 812	3 491	3 487	3 384	3 380	3 278	3 274	0 083	0 000	0 3813	0 3497	0 3196
20	100	3 7500	4 2667	3 24760	4 069	4 013	3 675	3 671	3 563	3 559	3 450	3 446	0 087	0 000	0 4013	0 3682	0 3364
21	105	3 9375	4 0635	3 40998	4 272	4 213	3 859	3 855	3 741	3 737	3 623	3 619	0 092	0 000	0 4214	0 3866	0 3533
22	110	4 1250	3 8788	3 57235	4 476	4 414	4 042	4 038	3 919	3 915	3 795	3 791	0 096	0 000	0 4415	0 4050	0 3701

All dimensions are given in inches.

Table 6 Dimensions of 30 Deg Involute Splines With 16 Teeth—Shaft (External)

Corresponding Ball or Roller Bearing Bores		Pitch Diameter	Diametral Pitch	Base Diameter	Outside Diameter		Root Diameters						Radius		Chamfer or Broken Edge		Minimum Recommended Major Diam of Involute Profile
							Shallow		Intermediate		Deep				F		
				D_b	D_o		A_e		B_e		C_e		R_e				
Bearing Number	Bore in Mm	D		D × 0.8660254	Max	Min	0.950D Max	0.940D Min	0.920D Max	0.910D Min	0.890D Max	0.880D Min	0.0161D Max	0.0054D Min	0.010D Max	Nil Min	
04	20	0 7500	21 3333	0 64952	0 7876	0 783	0 713	0 705	0 690	0 683	0 668	0 660	0 012	0 004	0 008	0 000	0 777
05	25	0 9375	17 0667	0 81190	0 9845	0 980	0 891	0 881	0 863	0 853	0 834	0 825	0 015	0 005	0 009	0 000	0 966
06	30	1 1250	14 2222	0 97428	1 1813	1 176	1 069	1 058	1 035	1 024	1 001	0 990	0 018	0 006	0 011	0 000	1 160
07	35	1 3125	12 1905	1 13666	1 3783	1 373	1 247	1 234	1 207	1 194	1 168	1 155	0 021	0 007	0 013	0 000	1 355
08	40	1 5000	10 6667	1 29904	1 5751	1 570	1 425	1 410	1 380	1 365	1 335	1 320	0 025	0 008	0 015	0 000	1 549
09	45	1 6875	9 4815	1 46142	1 7720	1 767	1 603	1 586	1 553	1 536	1 502	1 485	0 028	0 009	0 017	0 000	1 743
10	50	1 8750	8 5333	1 62380	1 9688	1 964	1 781	1 763	1 725	1 706	1 669	1 650	0 031	0 010	0 019	0 000	1 937
11	55	2 0625	7 7576	1 78618	2 1658	2 161	1 959	1 939	1 897	1 877	1 836	1 815	0 034	0 011	0 021	0 000	2 132
12	60	2 2500	7 1111	1 94856	2 3626	2 358	2 137	2 115	2 070	2 048	2 003	1 980	0 037	0 012	0 023	0 000	2 326
13	65	2 4375	6 5641	2 11094	2·5595	2 555	2 316	2 291	2 243	2 218	2 169	2 145	0 040	0 013	0 024	0 000	2 520
14	70	2 6250	6 0952	2 27332	2 7563	2 751	2 494	2 468	2 415	2 389	2 336	2 310	0 043	0 014	0 026	0 000	2 714
15	75	2 8125	5 6889	2 43570	2 9532	2 948	2 672	2 644	2 588	2 559	2 503	2 475	0 046	0 015	0 028	0 000	2 908
16	80	3 0000	5 3333	2 59808	3 1500	3 145	2 850	2 820	2 760	2 730	2 670	2 640	0 049	0 016	0 030	0 000	3 103
17	85	3 1875	5 0196	2 76046	3 3469	3 342	3 028	2 996	2 932	2 901	2 837	2 805	0 052	0 017	0 032	0 000	3 297
18	90	3 3750	4 7407	2 92284	3 5437	3 539	3 206	3 173	3 105	3 071	3 004	2 970	0 055	0 018	0 034	0 000	3 491
19	95	3 5625	4 4912	3 08522	3 7406	3 736	3 384	3 349	3 278	3 242	3 171	3 135	0 058	0 019	0 036	0 000	3 685
20	100	3 7500	4 2667	3 24760	3 9374	3 932	3 563	3 525	3 450	3 413	3 338	3 300	0 061	0 020	0 038	0 000	3 879
21	105	3 9375	4 0635	3 40998	4 1343	4 129	3 741	3 701	3 623	3 583	3 504	3 465	0 064	0 021	0 039	0 000	4 074
22	110	4 1250	3 8788	3 57235	4 3311	4 326	3 919	3 878	3 795	3 754	3 671	3 630	0 067	0 022	0 041	0 000	4 269

All dimensions are given in inches.

Inventor of the

BUILT-IN SEAL

Over 14 million N-D-Seal bearings have been used to simplify design, keep dirt out, keep lubricant in, and reduce installation and maintenance costs.

New Departure, Bristol, Connecticut.

NEW DEPARTURE
SELF-SEALED BALL BEARINGS

Involute-Spline Standards—II

to meet conditions imposed by engineering or production requirements.

The standard provides an option of three depths in each of five series covering 6, 10, 16, 24 and 36 tooth splines. The intermediate depth will probably be the most used, but it can be varied depending on the hardness of the spline members. Dimensions for 6 and 10 tooth splines were published in a previous issue (*AM*—Vol. 84, pages 433 and 434).

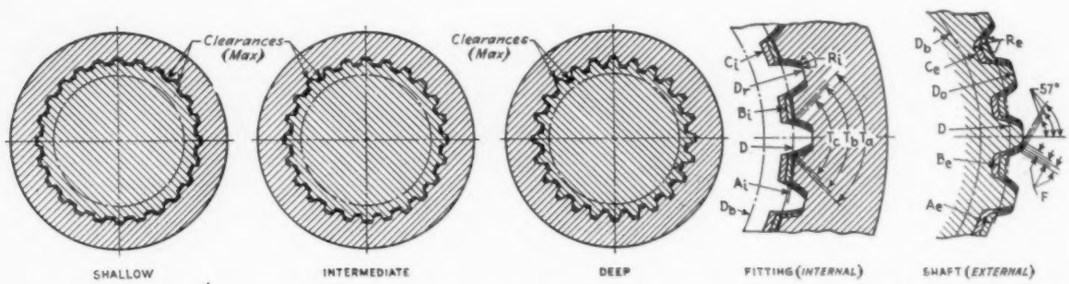


Table 7 Dimensions of 30 Deg Involute Splines With 24 Teeth—Fitting (Internal)

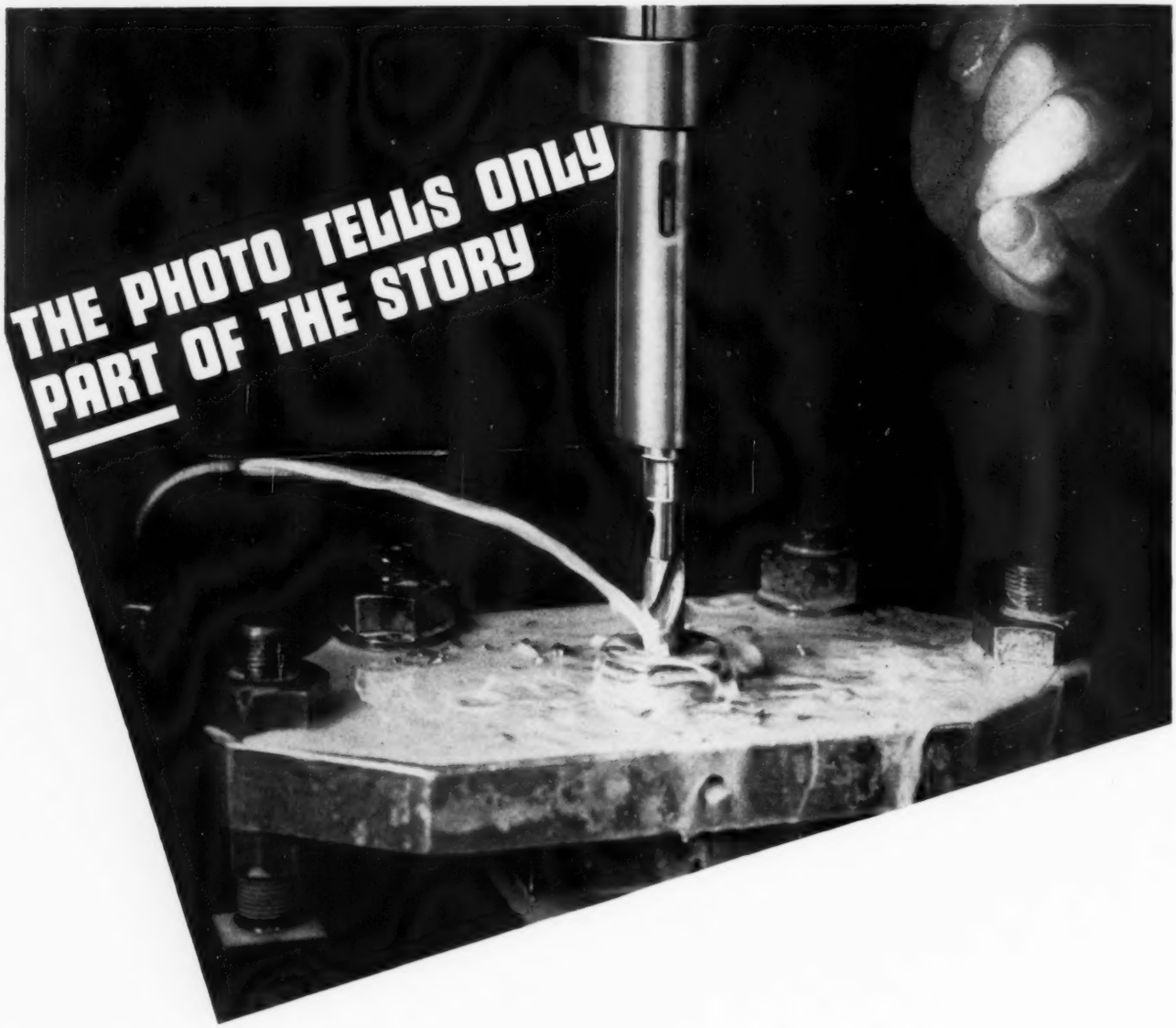
Corresponding Ball or Roller Bearing Bores		Pitch Diameter	Diametral Pitch	Base Diameter	Root Diameter		Inside Diameters						Radius or Broach Chamfer		Circular Width of Space at the Pitch Line		
							Shallow		Intermediate		Deep				Shallow	Intermediate	Deep
				D_b	D_r		A_i		B_i		C_i		R_i		T_a	T_b	T_c
Bearing Number	Bore in Mm	D		D × 0.8660254	1.070D Max	1.060D Min	1.010D Max	1.009D Min	0.980D Max	0.979D Min	0.950D Max	0.949D Min	0.010D Max	Nil Min	D × 0.083507	D × 0.074299	D × 0.065450
04	20	0 7500	32 0000	0 64952	0 803	0 795	0 758	0 757	0 735	0 734	0 713	0 712	0 008	0 000	0 0626	0 0557	0 0491
05	25	0 9375	25 6000	0 81190	1 003	0 994	0 947	0 946	0 919	0 918	0 891	0 890	0 009	0 000	0 0783	0 0697	0 0614
06	30	1 1250	21 3333	0 97428	1 204	1 193	1 136	1 135	1 102	1 101	1 069	1 068	0 011	0 000	0 0939	0 0836	0 0736
07	35	1 3125	18 2857	1 13666	1 404	1 391	1 325	1 324	1 286	1 285	1 247	1 246	0 013	0 000	0 1096	0 0975	0 0859
08	40	1 5000	16 0000	1 29904	1 605	1 590	1 515	1 514	1 470	1 469	1 425	1 424	0 015	0 000	0 1253	0 1114	0 0982
09	45	1 6875	14 2222	1 46142	1 806	1 789	1 704	1 703	1 654	1 652	1 603	1 601	0 017	0 000	0 1409	0 1254	0 1104
10	50	1 8750	12 8000	1 62380	2 006	1 988	1 894	1 892	1 838	1 836	1 781	1 779	0 019	0 000	0 1566	0 1393	0 1227
11	55	2 0625	11 6364	1 78618	2 207	2 186	2 083	2 081	2 021	2 019	1 959	1 957	0 021	0 000	0 1722	0 1532	0 1350
12	60	2 2500	10 6667	1 94856	2 408	2 385	2 273	2 270	2 205	2 203	2 137	2 135	0 023	0 000	0 1879	0 1672	0 1473
13	65	2 4375	9 8462	2 11094	2 608	2 584	2 462	2 459	2 389	2 386	2 316	2 313	0 024	0 000	0 2035	0 1811	0 1595
14	70	2 6250	9 1429	2 27332	2 809	2 783	2 651	2 648	2 573	2 570	2 494	2 491	0 026	0 000	0 2192	0 1950	0 1718
15	75	2 8125	8 5333	2 43570	3 009	2 981	2 841	2 838	2 756	2 753	2 672	2 669	0 028	0 000	0 2349	0 2090	0 1841
16	80	3 0000	8 0000	2 59808	3 210	3 180	3 030	3 027	2 940	2 937	2 850	2 847	0 030	0 000	0 2505	0 2229	0 1963
17	85	3 1875	7 5294	2 76046	3 411	3 379	3 219	3 216	3 124	3 121	3 028	3 025	0 032	0 000	0 2662	0 2368	0 2086
18	90	3 3750	7 1111	2 92284	3 611	3 578	3 408	3 405	3 308	3 304	3 206	3 203	0 034	0 000	0 2818	0 2508	0 2209
19	95	3 5625	6 7368	3 08522	3 812	3 776	3 598	3 595	3 491	3 487	3 384	3 380	0 036	0 000	0 2975	0 2647	0 2332
20	100	3 7500	6 4000	3 24760	4 013	3 975	3 788	3 784	3 675	3 671	3 563	3 559	0 038	0 000	0 3132	0 2786	0 2454
21	105	3 9375	6 0952	3 40998	4 213	4 174	3 977	3 973	3 859	3 855	3 741	3 737	0 039	0 000	0 3288	0 2926	0 2577
22	110	4 1250	5 8182	3 57235	4 414	4 373	4 166	4 162	4 042	4 038	3 919	3 915	0 041	0 000	0 3445	0 3065	0 2700

All dimensions are given in inches.

Table 8 Dimensions of 30 Deg Involute Splines With 24 Teeth—Shaft (External)

Corresponding Ball or Roller Bearing Bores		Pitch Diameter	Diametral Pitch	Base Diameter	Outside Diameter		Root Diameters						Radius		Chamfer or Broken Edge		Minimum Recommended Major Diam of Involute Profile
							Shallow		Intermediate		Deep						
				D_b	D_o		A_e		B_e		C_e		R_e		F		
Bearing Number	Bore in Mm	D		D × 0.8660254	Max	Min	0.990D Max	0.980D Min	0.960D Max	0.950D Min	0.930D Max	0.920D Min	0.010D Max	0.0054D Min	0.010D Max	Nil Min	
04	20	0 7500	32 0000	0 64952	0 7876	0 783	0 743	0 735	0 720	0 713	0.698	0 690	0 008	0 004	0 008	0 000	0 777
05	25	0 9375	25 6000	0 81190	0 9845	0 980	0 928	0 919	0 900	0 891	0 872	0 863	0 009	0 005	0 009	0 000	0 966
06	30	1 1250	21 3333	0 97428	1 1813	1 176	1 114	1 102	1 080	1 069	1 046	1 035	0 011	0 006	0 011	0 000	1 160
07	35	1 3125	18 2857	1 13666	1 3783	1 373	1 299	1 286	1 260	1 247	1 221	1 207	0 013	0 007	0 013	0 000	1 355
08	40	1 5000	16 0000	1 29904	1 5751	1 570	1 485	1 470	1 440	1 425	1 395	1 380	0 015	0 008	0 015	0 000	1 549
09	45	1 6875	14 2222	1 46142	1 7720	1 767	1 671	1 654	1 620	1 603	1 569	1 553	0 017	0 009	0 017	0 000	1 743
10	50	1 8750	12 8000	1 62380	1 9688	1 964	1 856	1 838	1 800	1 781	1 744	1 725	0 019	0 010	0 019	0 000	1 937
11	55	2 0625	11 6364	1 78618	2 1658	2 161	2 042	2 021	1 980	1 959	1 918	1 897	0 021	0 011	0 021	0 000	2 132
12	60	2 2500	10 6667	1 94856	2 3626	2 358	2 228	2 205	2 160	2 137	2 093	2 070	0 023	0 012	0 023	0 000	2 326
13	65	2 4375	9 8462	2 11094	2 5595	2 555	2 413	2 389	2 340	2 316	2 267	2 243	0 024	0 013	0 024	0 000	2 520
14	70	2 6250	9 1429	2 27332	2 7563	2 751	2 599	2 573	2 520	2 494	2 441	2 415	0 026	0 014	0 026	0 000	2 714
15	75	2 8125	8 5333	2 43570	2 9532	2 948	2 784	2 756	2 700	2 672	2 616	2 588	0 028	0 015	0 028	0 000	2 908
16	80	3 0000	8 0000	2 59808	3 1500	3 145	2 970	2 940	2 880	2 850	2 790	2 760	0 030	0 016	0 030	0 000	3 103
17	85	3 1875	7 5294	2 76046	3 3469	3 342	3 156	3 124	3 060	3 028	2 964	2 932	0 032	0 017	0 032	0 000	3 297
18	90	3 3750	7 1111	2 92284	3 5437	3 539	3 341	3 308	3 240	3 206	3 139	3 105	0 034	0 018	0 034	0 000	3 491
19	95	3 5625	6 7368	3 08522	3 7406	3 736	3 527	3 491	3 420	3 384	3 313	3 278	0 036	0 019	0 036	0 000	3 685
20	100	3 7500	6 4000	3 24760	3 9374	3 932	3 713	3 675	3 600	3 563	3 488	3 450	0 038	0 020	0 038	0 000	3 879
21	105	3 9375	6 0952	3 40998	4 1343	4 129	3 898	3 859	3 780	3 741	3 662	3 623	0 039	0 021	0 039	0 000	4 074
22	110	4 1250	5 8182	3 57235	4 3311	4 326	4 084	4 042	3 960	3 919	3 836	3 795	0 041	0 022	0 041	0 000	4 269

All dimensions are given in inches.



● Action photography caught this stream of coolant right in "midstream," so to speak. It even "stopped" the drill which was churning in at a speed of over 500 R. P. M.

But the photo does *not* show the study that a G. T. D. Greenfield engineer put into this particular job. It does *not* show long discussions of jig design. It does *not* show a number of tests made to determine the best speed to drill the particular alloy steel used in the part for which this jig was designed. It does not and cannot show the cooperation which *"Greenfield"* sales engineers give to every *"Greenfield"* customer, large or small, to enable him to get only the best out of his *"Greenfield"* tools — to get more production at less cost than from any other tools he can buy anywhere. And because G. T. D. Greenfield is a large, experienced concern, *"Greenfield"* is able to furnish this type of service at no extra cost.

So, when you look at this photograph, remember that what it does *not* show is far more important than what the camera caught.

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GTD GREENFIELD

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No Time To Waste

WHAT TIME-WASTERS the democracies are! In normal years it is merely exasperating. In crises it may be fatal.

Britain knew in '37 she was in for it, and started to make aircraft and munitions. But she fiddled around and today is in a bad hole because she took forever to make decisions and co-ordinated action was lacking.

France has been worse. While she legislated the forty-hour week and her workers conducted sitdown and slowdown strikes, Germany produced armament night and day. Instead of social gains the French may have brought upon themselves the dissolution of a great empire. Time-wasting was a disastrous extravagance.

Are we in the United States doomed to a repetition of the tragic performances of Britain and France? Every week, every day, every hour, every minute is precious in our race to arm ourselves for defense.

Most people know that mass production yields magnificent results, but few are aware that tooling for mass production takes months.

The mere appropriation of billions is meaningless. The question is how quickly can they be transformed from dollars into defense weapons. Experience teaches us it will be months, in some cases two years, before industry will be ready to make aircraft and munitions *en masse*. A long time lag cannot be eliminated.

Action can be taken, however, to whittle down the time. Authority for the Army and Navy to negotiate contracts would help. Placing of arsenals on double shifts of ten hours each would produce better results than three eight-hour shifts, say army officers. Legislation restricting hours of work and imposing other throttles on production, typified by the Walsh-Healey Act, should be modified. But these things are not done at all or only after much delay.

Two factors explain Germany's military success: unity of command and having the right things at the right place at the right time. Germany has no copyright on this technique. It can be applied in a democracy, and specifically to the job of preparing ourselves for hemisphere defense.

In a flood emergency Cincinnati voted extraordinary authority to its city manager which he exercised with great ability so long as the crisis existed. In the world war the United States finally delegated extraordinary power over industry to Bernard Baruch which he ably used until the war's end and then relinquished.

We can and should do the same today. What we need is unity of command lodged in a non-political personality. He should have wide authority over industry's part in armament production, an authority not dependent upon persuasion of tongue alone, as it is now. It would be clearly specified, of course, that such authority would exist only so long as the emergency lasts. A man worthy of that responsibility and trust, William S. Knudsen, is in Washington serving his country.

Given reasonable time and full authority, Mr. Knudsen could do a fine job. We could rest easy that the right things would be at the right place at the right time. Let's not be time-wasters in a grave crisis. Our democratic way of life is too precious to imperil. Unity of command should be established at once.

Burnham Finney

GAGING BUSINESS

British have taken over French machine tool and plane orders. U. S. defense program to speed up operations further. Steel nears top capacity. Shipbuilding and plane industries expand

French capitulation will have no adverse effect on the extraordinarily high operations of the metal-working industry. Most of the French orders have been taken over by the British who themselves have made enormous purchases the past ten days. The government's armament program is expected to bring fairly rapid intensification of activities throughout the metal-working field.

Machine Tools—June will be one of the biggest months for new orders since last September when bookings sky-rocketed. There has been no stoppage of manufacture on French contracts of which $75,000,000 are outstanding. Most of the machines tagged for French delivery are suited for use by either the British or the U. S. government in its defense program or by private buyers eager for quick deliveries. Though the release of French machines will ease the delivery situation slightly, most machine tool builders have solid order books for the remainder of the year. The industry is cooperating closely with Washington to make sure that Army and Navy requirements get first attention. It is estimated that this year machine tool companies will turn out almost $400,000,000 worth of equipment.

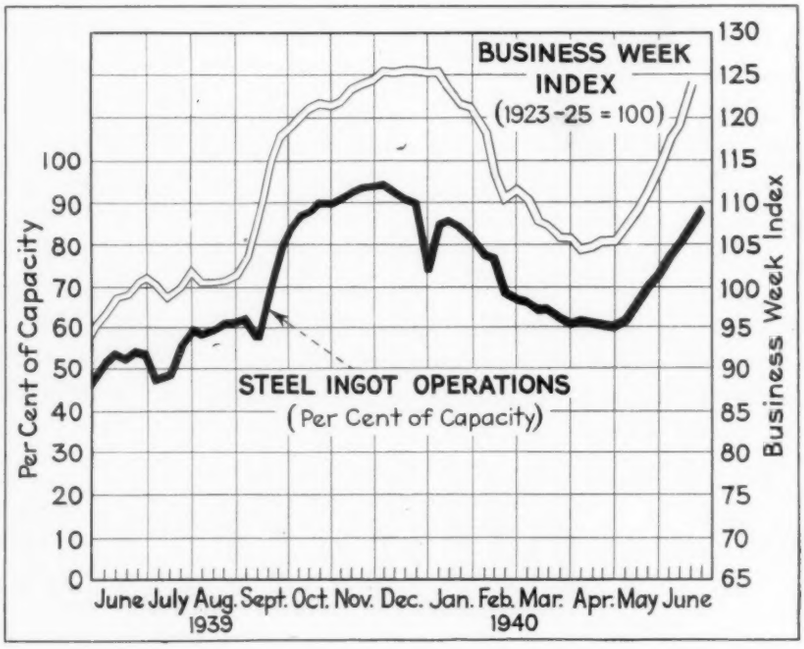
Munitions—The British have placed important contracts, and pending awards from the U. S. government are large. Motor truck makers are to build tanks shortly, according to reports. Marmon-Herrington at Indianapolis is enlarging its capacity to manufacture Army combat tanks as well as light tanks for the Marine Corps. In October Pullman Standard will start making shells for the British at Butler, Pa. Willys-Overland is expected to get sizable contracts for shells shortly. Army arsenals and navy yards are authorized to go on two or three shifts as necessity demands, but no employee may work more than eight hours a day or 40 hours a week. Army and Navy will spend $738,000,000 for ordnance, biggest purchases being for 1.1-in. naval anti-aircraft guns, submarine nets and airplane armament. About $60,000,000 of the President's $200,000,000 blank check from Congress will go for expediting ordnance production.

Aircraft—Steps are being rapidly taken to increase both plane and engine building capacities. Consolidated is doubling its plant size, while Ranger is rushing to completion a factory addition. Three airplane companies on the West Coast are reported ready to build manufacturing facilities in TVA territory as part of the program for putting defense industries inland. Shortage of high horsepower engines will be the industry's biggest problem. All of France's plane and engine orders in this country, including 2,910 combat planes and 400 trainers, have been taken by the British.

Steel—When steel mills operate around 90 per cent, where they are now, they are virtually at full capacity, since a certain number of open-hearth furnaces are always down. Stimulation of armament demand, approach of a new automotive season and a thriving export trade are factors assuring top operation for weeks to come.

Shipbuilding—Creation of an Atlantic fleet on top of the naval expansion already authorized will nearly triple the number of ships afloat. Construction of further shipyard facilities, under the circumstances, appears inevitable. For that purpose $85,000,000 will be spent, $59,000,000 in private yards and $26,000,000 in navy yards. Eleven navy yards today are employing 100,000 men, the highest in history. Contracts for 22 ships amounting to $362,000,000 have been let. The New York and Philadelphia navy yards will each build a battleship, Boston and Charleston yards two destroyers each, and Portsmouth three submarines. New York Shipbuilding will construct two light cruisers, Bath Iron Works and Federal Shipbuilding two destroyers each, and Electric Boat three submarines.

Railroad Equipment—Though freight car orders for the first five months of 1940 were 20 per cent less than a year ago, June has been more active. Great Northern has a $21,000,000 program for new and reconditioned equipment, including $6,000,000 for 1,500 cars ordered from Pullman and for 500 from Pressed Steel Car. Missouri Pacific has contracted for eleven diesel switchers, 200 stock cars from American Car & Foundry, 30 hopper cars from Mount Vernon and a three-unit streamline train.



FORD CONTRACTS TO BUILD AIRPLANE ENGINES

Liquid-cooled Rolls-Royce type units ordered by British and U. S. Tolerances eased on Allison engine. Plans made for aircraft plants in TVA territory. British to take over French orders

WASHINGTON—The Ford contract to build 9,000 redesigned Rolls-Royce aircraft engines is the first fruit of the Morgenthau-Mead-Knudsen rationalization of aircraft engine manufacture. Early similar contracts with Wright and Pratt & Whitney are expected. Liquid-cooled engines have been given first attention because the U. S. government and the Allies are out on a limb with their best pursuit planes (6-40, P-40D, Aircobra) designed around such engines which never have got into quantity production.

Negotiation of the Ford contract means that Edsel Ford was able to convince Mr. Knudsen that the Ford company could tool up in six months and start manufacture at a rate of 1,000 a month or better. In contrast General Motors has had tough experience with the Allison engine, and Chrysler is reported to have turned down an offer to make the Rolls-Royce engine on the ground that the engine is not suited to mass production. Chrysler, it is understood, would rather try its hand at tanks.

Washington observers attach no great significance to Henry Ford's demurrer to production for Britain. They attribute it to an intra-company dispute and point to Mr. Knudsen's insistence that Edsel Ford was fully aware of the nature of the contract.

U. S. Working With Briton

Many manufacturers still are not aware of the extent to which Allied and U. S. procurement is interlocked through Secretary Morgenthau and the Defense Commission. It is admitted that if Britain keeps fighting, the entire 9,000 Rolls-Royce engines to be built by Ford will go abroad and that deliveries to the Army and Navy will be deferred, as on airplanes. The U. S. order for 3,000 motors is covered by a $45,000,000 appropriation with no matching appropriation for airplanes to use them. The purpose of the domestic order is to protect Ford in the event the British should stop buying and probably to provide legal means for the government to share in the necessary plant investment. If Ford should hold out against supplying Britain, terrific pressure would be brought to bear on him.

Acquisition of rights to the Hispana-Suiza aircraft engine by the U. S. government does not indicate immediate plans to produce this liquid-cooled type. It is valued as a reserve unit in case neither the Allison nor the Rolls-Royce Merlin can be produced in volume satisfactorily.

Biggest factor in redesign of the Rolls-Royce, and perhaps in stepping up Allison production, will be relaxation of close tolerances formerly required. Just before dumping the aircraft problem in Mr. Knudsen's lap, Mr. Morgenthau had obtained the Army's consent to change specifications to permit looser fits. Dr. George Mead, Mr. Knudsen's engine advisor, points out that present tolerances envisage an engine life of 6,000 hours. An engine of lower standard, he thinks, will run just as well and be a lot easier to build.

BRITISH TAKE FRENCH PLANES

WASHINGTON—Airplanes of all types delivered to the Allies since the outbreak of the war last September total 2,200. Approximately 10,000 are on order at this time and 1,000 are on option. These facts were obtained by *American Machinist* in an interview with executives of the British Purchasing Commission. All orders placed by France before the capitulation of Paris have been taken over by the British.

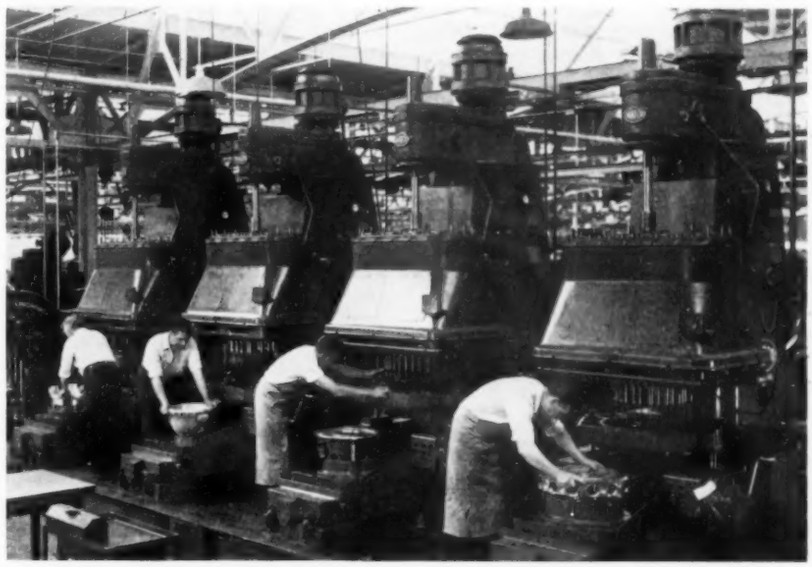
The Anglo-French Commission did not have definite figures on the division of orders as between France and Britain because deliveries were shifted back and forth for strategic reasons. In general, though, they were divided about half and half. It is said on good authority outside the commission that the British are prepared to take all or any part of the output of American plants for the next eighteen months—whatever the U. S. government may see fit to give them.

SOUTH TO BUILD AIRCRAFT

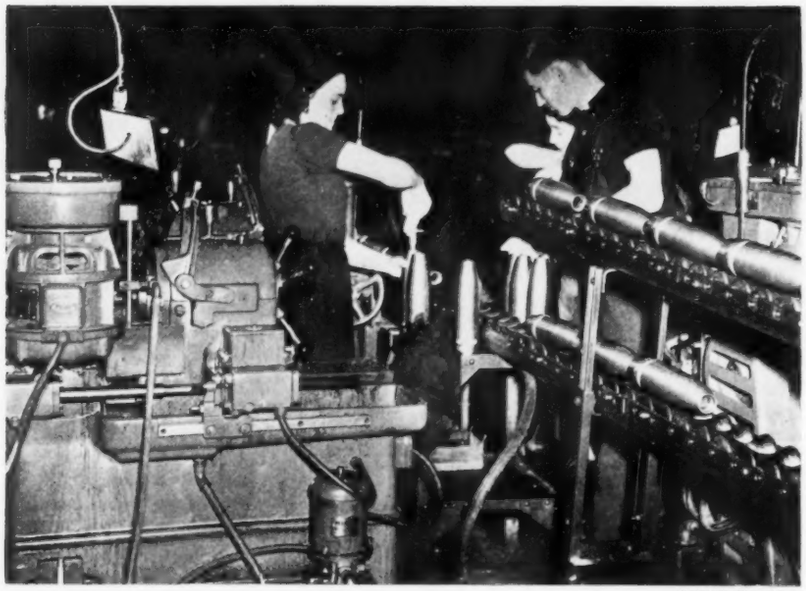
WASHINGTON—To get away from the seacoast and to help rehabilitate the South plans are under way for aircraft manufacture to be established in TVA territory. It is reported that Douglas, Consolidated and possibly Lockheed have agreed to erect plants there. The Defense Commission will ask Congress for $65,000,000 for immediate expansion of TVA electric power and $25,000,000 in supplemental estimates for immediate use. A bill soon will be passed by Congress authorizing the government to pay 30 per cent in advance on airplane contracts to cover the cost of necessary plant expansions in connection with national defense. Arrangements are being made by the government for airplane engine manufacture to be established in more protected areas.

Simplification of Materials Object of Defense Commission

WASHINGTON—Reduction of the number of special steels used in the production of aircraft engines is definitely the objective of the Defense



Upping Airplane Output—*A line of multi-spindle drilling machines, installed by Pratt & Whitney Aircraft, marks the transition from small lot to mass production. This is the first published view of the new wing*



British Combine

Too Late—*France now pays the penalty for a late start in munitions making. This French shadow plant went to work on shells after war was declared. Altogether 1,700,000 men and 800,000 women were employed but not soon enough to offset the dawdling days of the Blum regime*

Commission. W. S. Knudsen, head of the production section, is advising with the Society of Automotive Engineers, the American Society for Testing Materials, and Dr. Lyman Briggs, of the Bureau of Standards, on this matter. In fact, the variety of materials must be reduced in all lines of munitions and equipment—and in supplies, such as textiles.

During the World War, this country reached a pretty good level of standardization of materials though nothing near what the Commission is now aiming at. After the war of 1918, industry drifted away from the standards, each researcher and manufacturer going his own way. Individualism in materials was augmented by the two depressions which intervened.

The materials market became a buyers' market—anybody who asked for a special material got special attention. Special steels made a good selling argument, though the facts never went so far as the advertising copywriters did. The tailor-made steel era was not a bad thing; it brought out new materials that made better products. But now the time of simplification has come; not only products but steels are being streamlined for mass production. The authorities taking responsibility for this change have no fears for its effect. It is claimed that the changes in alloys and heat-treatments will not appreciably reduce the quality and performance of essential products.

Japanese Aircraft Expansion Hampered by Lack of Imports

TOKYO—Washington's "moral embargo" on aircraft exports to Japan, together with heavy Anglo-French buying competition in the United States, has effectively choked off Japanese imports of American planes and engines. Since the lapsing of the American-Japanese Treaty of Commerce and Navigation, January 26, even imports of production tools have fallen off, mainly because neither importers in Japan nor manufacturers in the U. S. are willing to run the risks inherent in the treatyless trade.

Most foreign aircraft technicians have left. These are some factors which the Japanese Army did not take into account when it drafted its six-year armament expansion plan (in which aircraft takes a prominent place). The plan was supposed to get under way on April 1.

Japanese Look to Italy

With assistance from Germany, England and France unavailable, the Japanese were looking to Italy for help. Japan was fishing for a trade treaty, sent friendship missions to its anti-Comintern ally. An Italian firm pulled down a big order for machine tools, agricultural implements and tractors for delivery in Manchukuo, but when the Japanese got down to brass tacks, Rome asked for time to think it over.

Last November, the Japanese Army had sponsored a 30,000,000-yen International Aircraft Co., still earlier a 30,000,000-yen Manchu Aircraft Corp. International Aircraft had definite ideas about getting assistance from Fiat, Turin, famed makers of bombers and radial aircraft engines. The president of the Manchurian firm recently went in person to Italy (and Germany) to speed up matters.

Italy Says "No"

Fiat has ultimately come out with a reply. The reply: Japan had better order equipment in the U. S. or Germany if she is so much in a hurry about it. More recent information indicates that the Japanese firm may obtain a small portion of its production equipment from Italy, with most of the 75,000,000-yen project still in the air. International planned to spend 45,000,000 yen on equipment, 6,000,000 yen on blueprints, licenses and foreign technicians, 10,000,000 yen on buildings and 6,000,000 yen on the plant site.

Similar difficulties have prompted the two-year-old 100,000,000-yen Manchu Automobile Industry Co., which has yet to produce its first car, to buy out the equipment of the Nissan Automobile Co., which, in turn, belonged originally to Graham-Paige. The transfer is likely to be effected next fall.

PROFIT LIMIT MAY BE CUT

WASHINGTON—A seven per cent profit limitation on both shipbuilding and aircraft production is proposed in the new $4,000,000,000 Navy expansion bill. Profit limit under present law is ten per cent on ships and twelve per cent on aircraft for both Navy and Army. Witnesses from both Services and from the Defense Commission favored retention of the present limits because any reduction might make manufacturers reluctant to undertake difficult bottleneck items for defense. Committeemen in Congress on military and navy affairs were proposing a compromise on ten per cent.

Witnesses before Naval Affairs testified that the Navy has written about a billion dollars in negotiated warship contracts, guaranteeing builders ten per cent profit. Chairman Walsh said steps would be taken to stop the practice. Admiral W. R. Furlong explained in committee that builders are not permitted to charge off the entire cost of installing machinery. He cited three plants where investments in machine tools amounted to $2,000,000.

UAW-CIO Union Glad to Settle For GM's Original Pay Proposals

DETROIT—After failure to get backing from Washington on its demand for a general wage increase of approximately ten per cent upon the ground that labor must be satisfied before national defense programs are started, the UAW-CIO last week unanimously urged ratification of a revised contract that includes a vacation allowance, the corporation's previously proposed schedule of wage adjustments and an umpire to pass final judgment upon grievances. The vacation allowance and the umpire provisions are new in contracts with automobile companies.

Union sources estimated that the original wage-increase demand would have cost the corporation up to $25,000,000 yearly. Not all workers would necessarily have shared the same; it being proposed that the union adjust wages with plant managers so that the average increase would amount to ten cents per hour per worker. Some employees would get more, others less.

Now it is likely that a number of workers will not get an increase, outside of the vacation allowance. There is lack of agreement between corporation and union upon what the actual total outlay will be. The UAW calls the vacation allowance a "CIO dividend" of $7,000,000, and speaks of a wage raise of $5,000,000, which is "the equivalent of an average increase of 1½ cents per hour for all employees covered in the agreement as of May 1." On the other hand a company source estimated that the vacation allowance would cost $5,000,000 and the entire settlement would not add up to more than $8,000,000 yearly.

Fear Public Reaction

Failure to get help from the government and fear of public reaction to a strike are believed reasons why the union is now glad to take what it can get and to play up the "gains" to its membership. While the corporation was willing to improve many parts of the contract and to speed the settlement of grievances, promises were exacted that prohibit sit-down, stay-in and slow-down strikes and any other form of work stoppage until all bargaining steps have been taken. Furthermore an authorized strike in one unit will be construed as a strike in other units affected because of interference with flow of materials or services. This provision rules out such tactics as a strategically placed strike in order to accomplish a larger end. Furthermore it prevents workers in affected plants from acquiescing in a strike called at the strategic point, because all workers affected may now lose unemployment compensation. In other words, this section of the contract may prevent such awards as the $23,000,000 compensation allowed to Chrysler workers in plants affected by the slow-down last fall but not actively participating.

The shop steward system was not granted. Operators will continue to take up grievances directly with the foreman, but may call in the shop committeeman. The old contract provided one committeeman to 300 employees, the new proposal one committeeman to 250 employees.

SHIP FIGHTER TESTED

EAST HARTFORD, CONN.—Tests are now being conducted on the latest type of shipboard fighter for the U. S. Navy by the Vought-Sikorsky-Aircraft Division of the United Aircraft Corp. The new plane is a single-place, single-engine, all-metal monoplane and will soon be turned over to the Navy for official acceptance tests. Spot welding of the monocoque fuselage gives smooth finish and contributes to the plane's performance. The engine is an 18-cylinder P. & W. two-row radial rated at 1,850 hp. for take-off. Wing span is approximately 40 ft. and overall length 30 ft.

ASME Offers Services to Nation; New Officers Named at Milwaukee

MILWAUKEE — The semi-annual meeting of the American Society of Mechanical Engineers opened here last Monday with a pledge for the defense of the nation and a resolution to provide the government with a list of members' experience to make possible maximum utilization of their capabilities for specialized duty. The Society's committee on national defense will be expanded from its present membership of W. C. Dickerman, American Locomotive Co., Thomas A. Morgan, Sperry Co., K. H. Condit, dean of engineering, Princeton and consulting editor of *American Machinist*, and J. L. Walsh, consulting engineer, New York.

W. H. McBryde, president, emphasized that "we have enough skilled men but the government cannot draft or put into combat service skilled men needed in industry to maintain" the fighting man. He said that three men back of the lines to one fighting man was all that had been required in the last war, but increased mechanization now made twelve necessary.

One underlying error in our educational system of today is the failure to appreciate that the chief objective should be to train a student in logical thinking and to develop his creative imagination, according to W. H. Carrier, Carrier Corporation. He said that four aircraft manufacturers with which he was familiar had all stressed that they preferred broad engineering background based on training in fundamentals.

John E. Ryan and A. R. Stevenson, Jr., General Electric Co., discussed the means by which ingenuity and design ability may be discovered among young engineers.

F. O. Volz, Lakeside Bridge & Steel Co., pointed out the advantages of reducing production time by the use of welding, particularly for machine frames. Machine tool castings and the result of two years' work in reducing galling of ways was reported on by F. J. Dost, Sterling Foundry Co. He found that when troubles with galling were experienced photomicrographs disclosed a peculiar structure; changes in composition and foundry technique has now brought this under control.

E. E. LeVan, Haynes Stellite Co., discussed the possibilities, procedures and application of hard facing. F. J. Trecker, Kearny & Trecker, told of the possibilities of eliminating lengthy layout operations for tool and die milling.

ASME NOMINATIONS

PRESIDENT

William A. Hanley, *in charge of engineering, Eli Lilly & Co.*

VICE-PRESIDENTS

Dean Samuel B. Earle, *school of engineering, Clemson Agricultural College.*

Frank H. Prouty, *partner, Prouty Bros. Engineering Co.*

Edwin B. Ricketts, *Mechanical Engineer, Consolidated Edison Co. of N. Y.*

MANAGERS

Prof. Huber O. Croft, *head of M. E. Dept., State University of Iowa.*

Prof. Paul B. Eaton, *charge of M. E. Dept., Lafayette College.*

George E. Hulse, *chief engineer, Safety Car Heating & Lighting Co.*

Spokane Selected for A.S.M.E. Fall Meeting

NEW YORK—Technical sessions will be held September 3 and 5 for the 1940 fall meeting of the American Society of Mechanical Engineers. Headquarters will be at Hotel Davenport, Spokane, Wash.

This arrangement leaves September 4 and 6 open for inspection trips which include a visit to Grand Coulee Dam.

Apprenticeship Committee to Train Many More Men for Industry

WASHINGTON—A plan for a five-fold increase in the number of apprentices in the skilled trades has been formulated by the Federal Committee on Apprenticeship. Unofficial estimates put the number of apprentices today at fewer than 100,000, whereas an immediate need exists for five times that number.

Semi-skilled "specialists" and a comparatively small number of highly skilled men are the two major requirements for national defense reports the Committee. The report says that "the mass of workers in modern production plants are semi-skilled. The smooth flow of work depends on an adequate working force of skilled craftsmen who are the 'lead men,' who are the 'set-up' men and who know all of the operation in a particular trade."

Semi-skilled men can be trained in a relatively short time within industry and in conjunction with existing vocational educational facilities. Such training can be immeasurably speeded up. However, the training of apprentices to become skilled mechanics cannot be shortened much, as was proved during the world war.

The Federal Committee on Apprenticeship will widen its activities at once (1) to provide an adequate supply of skilled mechanics, (2) to enable those already partially trained through employment in occupations requiring a narrow range of skills to secure an opportunity to complete an apprenticeship in the shortest possible time and become skilled workers, and (3) to facilitate the orderly absorption of apprentices into industry.

It is recommended that the Committee's field staff be expanded to have representatives in the country's 33 major industrial areas.

A survey of the metal-working industry shows that the most-favored quick-training plan is to break in a machine hand or "learner" under leadership of an experienced man. A learner can be trained in 60 to 90 days to run one type of machine.

Cooperation with public vocational schools has helped supply men for some industries.

MILWAUKEE PLANS 8-WEEK COURSE

MILWAUKEE — William F. Rasche, vocation school director, and Walter Ecker, district NYA supervisor, have completed plans for intensive training of 1,200 young people of which 900 will be in machine shop, welding, foundry, pattern making, sheet metal, metallurgy, automotive servicing or diesel engine work. The school will run five days a week from July 1 to August 31, with the metal trades departments running three seven-hour shifts a day.

Blitzkrieg's Birth — *German workmen assemble an airplane engine at the Bavarian Motor Works. Mass production proceeds on a three-shift basis. The connecting-rod, crankshaft assembly is shown being fitted to the crankcase*

Interphoto

TESTING SOCIETY ELECTS

ATLANTIC CITY, N. J.—At the opening session of the annual meeting of the American Society for Testing Materials, at Atlantic City, June 25, the following officers were announced for the 1940-41 term:

PRESIDENT

William M. Barr, *chief chemical and metallurgical engineer, Union Pacific Railroad Co.*

VICE-PRESIDENT

Herbert J. Ball, *department of textile engineering, Lowell Textile Institute*

MEMBERS OF EXECUTIVE COMMITTEE

Roger C. Griffin, *treasurer, Arthur D. Little, Inc.*

Paul D. Merica, *vice-president and director, The International Nickel Co., Inc.*

Jerome Strauss, *vice-president, Vanadium Corp. of America*

Stanton Walker, *director, Engineering and Research Division, National Sand and Gravel Assn.*

C. H. Fellows, *Research Department, Detroit Edison Co.*

AUTO ASSEMBLIES DROP

DETROIT—Passenger car and truck assemblies during July are expected to fall below the 218,478 units produced a year ago, because so many passenger car producers will cease current-model production in June or early in July. A number of the independents will be down at the end of June, including Packard, Hudson and Willys; Nash was shut-down last week for inventory purposes and could not tell whether 1940 production would be resumed. General Motors divisions like Pontiac, Olds and Buick will follow in a week or two. Chrysler divisions are more likely to continue through July on reduced schedules because the 1941 die program is late. June production will approximate 350,000 units, July may not top 200,000.

Thus the major share of July's production will be accounted for by Chevrolet, Ford and Chrysler divisions. It is doubted that any of these producers will operate later than the first week or two of August. There is a strong possibility that Chevrolet will complete No. 1,000,000 of the 1940 series.

First to announce 1941 models is likely to be Hudson. Last year Hudson made public the details of its new cars at a press preview on August 9.

A dearth of 1940 cars may be expected before new model announcement time, because sales have been showing unusual strength in centers affected by war contracts and the possibility of such business. Furthermore, the public is beginning to fear higher prices on 1941 lines. West Coast cities adjacent to plane builders, Detroit, Cleveland and Pittsburgh are said to be feeling the urge to spend. There is nothing that automobile producers can do about the situation now, because it would take at least two months to obtain adequate supplies of materials and parts to continue current production.

WATCHING WASHINGTON

Realization grows that defense tooling will take time. Shell and powder look like "hottest" items. Resentment grows on belief needed arms sent abroad. Mysterious "embargo" explained

BY BLAINE STUBBLEFIELD

POLITICS IN DEFENSE?

WASHINGTON—Suspicion exists that the New Dealers are itching to get their finger in the affairs of Knudsen & Co. So far the President has kept Harold Ickes out of the operations. It is understood, however, that the past week some New Deal people have moved into important departmental jobs with the Advisory Defense Commission. Whether this is the beginning of further infiltration is not known.

WASHINGTON — Even if the President continues to give his Advisory Defense Commission the green light, anyone familiar with the time it takes to tool up for a difficult job will know that swinging into munitions production is a matter of many months rather than weeks. It was eight months from the time an educational order was given for anti-aircraft gun mounts until the first unit was produced. Government officials will be happy indeed if the whole program could get going in such a period.

There are plenty of "hot spots" which need attention. Aircraft engines is one. Manufacture of armor plate is another. Production of big guns and of tanks is still another. Small arms and ammunition will come in for much attention, too. Probably the biggest headache of all is securing adequate facilities for making smokeless powder. For that purpose alone some $245,000,000 is earmarked. At best, some of the material badly needed cannot be turned out for almost two years.

The problem confronting the ordnance department is tremendous. In the fiscal year 1938 it had $25,000,000 to spend for materials. During the coming fiscal year 1941 it will make an outlay of 24 times that amount or $600,000,000. If it gets authority to negotiate contracts, some red tape can be cut. But the preparation of bids, the time allotted for suppliers to put in their prices and the tooling-up period will consume months. If the country ever should be involved in war, the department would allocate $6,000,000,000 of work a year to 1,000 plants.

Educational orders are out for 45 items distributed among 90 concerns. Biggest educational problem of all, judged by the amount of money expended and the number of companies involved, is the forging and machining of shells. The Ordnance Department now has about 300 to 400 inspectors in the field. It may be necessary with the expanded program to establish training schools for inspectors, as was done in the world war.

Defense Begins at Home

Some Army and Navy officers are privately complaining that the airplanes and munitions being sold to the British are not in fact surplus, as the administration says; that this equipment is all the services have to work with, should the need arise; that it should be kept at home. But Generals Marshall and Arnold, and Admirals Stark and Tower, have testified before Congressional committees their approval of release of the equipment. Of course the President is the Commander in Chief of the Army and Navy and it is his constitutional right to control military as well as international policy. It is probable that most of the high command agrees with Mr. Roosevelt. After all the Army and Navy are simply a group of citizens, who naturally differ in their individual opinions, as Congress does.

Formula for Charge-Offs

The latent struggle between industry and the administration as to the method of paying for new plant required by the defense program is rapidly coming to a head. What the manufacturers want is a profit level that will permit them to charge off plant in a few years. But Congressional support for the measure actually to lower permitted profits to seven per cent suggests the political impracticability of the manufacturer's solution. What the administration has in mind is for the government to assume the "risk capital" function on war-necessitated expansions. In the case of plants to produce purely military goods, such as smokeless powder, it is about settled that the government will build and own the plants, leasing them to industry. In the more complicated cases of plants with both a military and a civil value, such as aircraft, the treasury is working out an as yet undisclosed "formula" under which the government would handle the remainder. A military certificate that the expansion is necessary for the national defense would be required. Manufacturers hate the idea of government equities, and fear the plan will put a brake on expansions.

Only an "Inventory"

The mysterious embargo on machine tools to Japan and Russia turned out to be no embargo at all. Here is what happened. The Vinson Act, about to be passed, provided authority for the Army and Navy to take over any export orders which might be needed for national defense. It was thought good policy, under the circumstances, to hold up foreign machine tool shipments temporarily until an inventory could be taken of the tools on hand. Those which would be vitally needed in a hurry by either service branch would be commandeered. Tools not immediately required or machines of special design which would not fit Army or Navy specifications then would be released for export delivery. Apparently the inventory job has been completed, for shipments to Russia are now going forward again.

Possible—Not Probable

A Wagner Act amendment is still possible this year, but improbable. The House passed the Smith Bill, which would set up a quasi-judicial board whose decisions would be subject to review by the courts. It also provides that the board must follow court rules of evidence; it limits back pay awards to one year. Both the big labor unions, to some extent, and the employers wholeheartedly would welcome amendment to the law; but the Senate labor committee hasn't held hearings on some phases of the proposed amendments.

Rubber Armor Plate

Airplane armor plate of rubber and steel, said to be superior in bullet penetration resistance to steel armor plate of 20 per cent greater weight, has been announced by the United States Rubber Co. A secret rubber compound was developed after three years experimentation to make this armor plate possible.

Canada Puts Pressure Behind Munitions Orders for Great Britain

MONTREAL—Munitions orders have been placed in Canada the past few weeks on a scale not seen since the latter part of the world war. In one afternoon, for instance, some $50,000,000 of contracts were approved at Ottawa. Within 60 days all factories supplying war materials will be working at top speed. Emphasis now is on immediate production and a minimum of red tape.

Fourteen plants are now manufacturing shells for the British and Canadian governments. Present orders call for 4,500,000 shells, with further contracts imminent. Sixty companies are engaged in making shell parts. With joint British and Canadian capital, an $8,000,000 plant is under way by Canadian Car & Foundry for filling shell casings with explosives. In addition, a $12,000,000 plant has been started by the government to make nitro-cellulose explosives. These two projects are over and above a program already announced for a $10,000,000 plant in northwestern Ontario to be completed this fall and a $10,000,000 plant in the Montreal area.

Bren Guns Beat Schedule

Small arms ammunition is being produced at Dominion Industries' factory at Brownsburg and at government arsenals at Quebec and Lindsa, Ont. Since all necessary supplies are being rushed to England in the present emergency, the Canadian government has ruled that no organization or agency or home defense unit may have a single rifle or ammunition without explicit order from the Department of Defense. The John Inglis Co. is turning out Bren machine guns six months ahead of schedule and is operating seven days a week.

Canadian manufacture of anti-tank and anti-aircraft shells has been increased by a third in recent weeks. Three plants are fully engaged in this program. Additions to these plants are now being rushed to completion.

Work in preparation for building tanks is going ahead 24 hours a day. The British have placed an order for 300 tanks of the Mark III Valentine type (British). Companies making these tanks will include Canadian Locomotive (Kingston), Montreal Locomotive Works, Angus shops of Canadian Pacific in Montreal, Dominion Foundries & Steel of Hamilton, and Turnbull Elevator Co. of Toronto.

Tanks will be fitted in Canada with caterpillar treads, gasoline engines and armor plate. The British government has been asked to send an expert on tank manufacture to assist in production.

CANADA BUILDS COMPLETE PLANES

MONTREAL—Complete Avro Anson planes will be built in Canada. Under original plans Britain was to furnish 1,600 of these twin-engined trainers, with wings, tails and assembly work to be done in Canada. However, the Canadian government has purchased 5,000 engines from U. S. sources. These engines are said to be 330-hp. Jacobs units.

National Steel Car of Hamilton plans to switch from production of Lysander planes to Harvards. De-Havilland Aircraft, with a plant just outside Toronto, has arranged for purchase of an ample supply of Monasco engines from California instead of using British engines. The company has been working full speed on 404 trainers for the air pilot program.

A serious handicap in the speed-up of war supplies in Canada is the shortage of skilled labor in the machine tool industry.

Congress Appropriates Funds To Step Up Munitions Capacity

WASHINGTON—An appropriation of $200,000,000 is expected to be made by Congress for the War Department to commence additional munitions production capacity. When the projects are completed, they will cost a total of $1,000,000,000. It is estimated about 50 per cent of the money will be spent for plant equipment and machine tools.

With the exception of existing arsenals, the new capacity would be created by utilizing private industry for construction and operation. It would not be employed except when private industry could not supply the demand. Products to be made in these new plants or in additions to old plants are ammunition, explosives, guns, fire control, tanks, armor plate and airplane engines. The length of time required to get into production is the longest on the most critical items. It will be approximately 22 months, for instance, to secure quantity manufacture of smokeless powder.

England started 38 ordnance plants five or six years ago. In no case was one in production in less than 12 months, and in some cases the time was three years. The average was two years.

RIFLE OUTPUT INCREASES

SPRINGFIELD, MASS.—Springfield Armory has doubled its production schedule on Garand semi-automatic rifles. Colonel G. H. Stewart, commanding officer, has announced that current output of these rifles has been 200 a day. The step-up to about 400 a day will be made as fast as materials and trained workers are obtained. Armory factories now have a working force of 2,700 men, which is likely to be increased to 4,000.

Tooling for Defense to Be Tool Engineers' Keynote

DETROIT—Plans for the semi-annual convention of the American Society of Tool Engineers, in Cincinnati, October 17-19, will center about preparing the mass-production industries for national defense. Those attending the convention will visit machine tool and mass-production shops in the Cincinnati area to learn what is being done to speed defense programs and the direction of such efforts. Technical sessions will be confined to the evenings. On October 17, educational, governmental and industrial leaders will discuss who should assume responsibility for the education required for mass production—including tool and die designing and other special subjects. For the dinner meeting, October 18, speakers will probe the problem of aeronautical preparedness. The third evening session, October 19, will be given over to a symposium on gear production. An attempt will be made to define the fields of gear finishing in respect to machining, grinding and lapping; included will be the finishing of aircraft gears.

Engineering Societies Set Up Personnel Service

NEW YORK—To meet legal requirements in the several states in which it operates employment service of the four Founder Engineering Societies has been incorporated and its name changed to Engineering Societies Personnel Service, Inc. This service over a period of seventeen years has placed more than 20,000 engineers in private industries and over 10,000 more on government projects, through its offices in New York, Chicago and San Francisco.

A fourth regional office will be opened in Detroit on July 1, according to James W. Parker, president of the Engineering Societies of Detroit and vice-president of the A.S.M.E. A temporary office will be located at the Hotel Statler, Detroit, until such time as it can move into permanent quarters.

INSIDE DETROIT

Ford gets orders for U. S. and British airplane engines. Savings to result from simplified methods. New welding methods and stainless steel may be applied to plane construction

BY RUPERT LE GRAND, DETROIT EDITOR

DETROIT—Well in advance of the announcement that Ford would build 6,000 Rolls-Royce Merlin airplane engines for the British and 3,000 for the U. S. government, equipment vendors thronged the purchasing lobby of the Ford company at Dearborn awaiting parts prints. This development takes the spotlight from Mr. Ford's declaration that he could easily build 1,000 planes a day and puts it on the even more difficult problem of manufacturing en masse high-quality, liquid-cooled aviation engines.

Fortunately the Ford organization does not embark on the Rolls-Royce without knowledge of the production problems involved. Two years ago plans were drawn to build the engine in France in a limited way. At that time it was said that the American production methods, and especially Ford methods, had been freely drawn on to cut operations, speed output and make a better product. Those plans did not mature because Mr. Ford was reported unwilling to engage in munitions manufacture for a foreign government. But lately Ford has been studying the Rolls-Royce engine for the purpose of simplifying many of its details.

Experienced Men Available

The Rolls-Royce organization in this country has moved into the Rouge plant. Many of the personnel are Ford men, being connected with the English company, which is expanding Rolls-Royce production in two new plants in Great Britain. These men have had to procure 1,000 or more machine tools and to develop improved tooling and manufacturing methods. Obviously their experience is available to the Ford organization here.

Simplification of methods is important in placing aviation engines on a mass-production basis. Close attention is being paid to reducing the time of manufacturing supercharger parts. The impeller is an example. As made for another engine, the impeller requires 50 hr. to machine and polish. Ford's method will take only 9 hr. Instead of a ring forging, a preformed shape will probably be used. This has the effect of reducing the amount of metal that need be cut away between the blades, facilitates form milling with a high finish, and improves the grain structure. Polishing time is sharply reduced.

The savings in impeller manufacture represent only a detail, but they strikingly bring out the efficiency of the Ford organization in improving an already highly developed mechanism. It is unlikely that an organization capable of mass production of a V-eight motor, of hardened steel cylinder liners, and development of cast steels for automotive purpose, will be lacking other tricks in connection with aviation engines.

The feverish planning now going on at Dearborn should pave the way for rapid release of equipment orders. It is doubted that Ford will depart from its conventional practice of buying a modest line to start with and then working out the "bugs" in manufacture as fast as possible. Later production set-ups would be duplicated to secure the desired output.

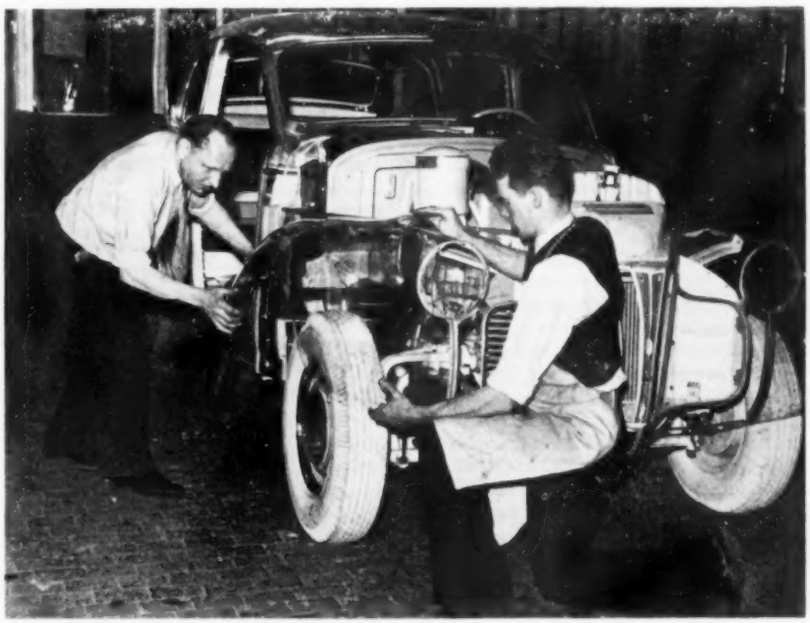
Just now it is impossible to predict when the first engine will be assembled and how soon any given output can be attained. Certain types of equipment will take four months or longer to get. Every vendor was tipped off a few weeks back to keep capacity available.

So far little activity has been noted at Ford in adapting airplane fuselage and wing construction to mass production methods. Some inquiries have been made for equipment with which to spot weld stainless steel in a manner similar to automobile body shop practice. Presumably mass plane output may depend upon the use of welding instead of tedious riveting and the substitution of stainless steel for aluminum alloys.

Use of stainless steel in considerable quantities for plane manufacture is not likely to place a serious burden upon the country's steel production facilities. Adequate melting capacity is said to be available—either that now used on stainless or similar equipment employed for other alloy steels. Besides a number of rolling mills are capable of rolling plenty of strip up to 24 in. wide in gages from 0.005 to 0.010 in. thick if not too much attention must be paid to slight surface imperfections. Large consumers such as the automotive interests might feel a pinch while the steel industry allocated production facilities to plane material, but there is probably plenty of time to make adequate provision for all customers.

New Welding Machines

Recent developments in welding machine controls may permit the use of spot welding on stressed aluminum aircraft components. Recently West Coast plane builders are said to have installed machines made by Sciaky, a Frenchman, for spot welding non-stressed members, but they can not



Fair Body—*This Pontiac is being fitted with a Plexiglas fender, part of a transparent body which bares the cars innards for demonstration purposes. The model is now on display at the New York World's Fair*

U. S. Defense Contracts Awarded

Contractor	Gov't Agency	Commodity	Amount
Baldwin Locomotive Works, Eddystone, Pa.	War Ordnance	Forgings for shell	$240,272
Gilbert & Barker Mfg. Co., Springfield, Mass.	War Ordnance	Parts for rifles	23,701
Tennessee Coal, Iron & Railroad Co., Birmingham	War Ordnance	Forgings for shell	123,759
Stockham Pipe Fittings Co., Brimingham	War Ordnance	Machined shell	69,957
The Wheland Co., Chattanooga	War Ordnance	Machined shell	66,758
Consolidated Steel Corp., Ltd., Los Angeles	War Ordnance	Demolition bombs	109,626
Omaha Steel Works, Omaha	War Ordnance	Machined shell	161,658
The Colorado Fuel & Iron Corp., Pueblo, Colo	War Ordnance	Forgings for shell	251,674
Key Co., East St. Louis, Ill	War Ordnance	Machined shell	164,205
W. C. Norris, Mfgr. Inc., Tulsa, Okla	War Ordnance	Machined shell	76,689
Chrysler Corp., Detroit	War Ordnance	Cartridge cases	154,082
National Broach & Machine Co., Detroit	War Ordnance	Machines, profiling	24,960
U. S. Motors Corp., Oshkosh, Wis	War Signal Corps	Power units	104,800
The E. A. Kinsey Co., Cincinnati	War Air Corps	Engine lathes	28,731
Phelps Dodge Copper Products Corp., Yonkers, N. Y	War Signal Corps	Wire	513,744
The Cessna Aircraft Co., Wichita, Kansas	CAA	Airplanes	99,568

extend the method to the entire plane because small hairline cracks are likely to be present in the weld. But through further development of the "Vanco" welding process, recently described, a high-wave control for spot welding aluminum has been perfected by the Taylor-Winfield Co. This welding control is said to afford sound welds that should prove acceptable to government authorities for spot welding any stressed or non-stressed aluminum-alloy aircraft assembly. So perhaps stainless steel does not have a clear field for adoption when mass output of planes is contemplated.

Col. MacMorland Outlines Ordnance Plans Before SAE Summer Meeting

WHITE SULPHUR SPRINGS — About 43,000 trucks and tractors, 861 scout cars, 94 combat cars, 324 light tanks and 176 medium tanks will be bought by the U. S. army in the fiscal year 1941 with money already provided, according to Lt. Col. E. E. MacMorland, Ordinance Department, Washington, in an address before the summer meeting of the Society of Automotive Engineers.

Col. MacMorland said that the choke point in defense today is high horsepower airplanes engines. A year ago it was thought that airframes would prove the bottleneck. He suggested the transfer of idle machine tools to munitions plants, should the demand for machine tools in the defense program become acute. For the armament program Col. MacMorland said there are enough skilled men. If war should come, a shortage would develop. There are only 70,000 toolmakers in the United States, and the number is decreasing.

Increasing demands by the Navy and by long-distance haulers for lighter diesel engines is leading to large substitution of aluminum for steel, said Frank Jardine, Aluminum Co. of America. Crankcase and cylinder block, cylinder sleeves, pistons, bearings, cylinder heads, valve seats, camshaft gears and gear covers can now be made of aluminum alloys.

Discussing the growing list of applications of rubber compounds, Roy W. Brown, Firestone Tire & Rubber Co., showed that new standards of quietness and performance have resulted from using rubber to deform elasticity when loaded. Rubber will deform some 30 times more than steel and nearly return to its original dimensions when the load is removed. Greatly increased car stability is looked for soon from the use of broader rims and bases for tires.

RESEARCH COMMISSION APPOINTED

WASHINGTON—Taking a leaf from Germany's demonstration of the value of technology in war, President Roosevelt has appointed a National Defense Research Commission. The new group will coordinate the researches of the Bureau of Standards, the National Academy of Sciences, the National Research Council in so far as they relate to defense—in fact the country's entire research effort except in the field of aviation. Aeronautics will be left in the hands of the National Advisory Committee for Aeronautics and the services. The Defense Research Commission is headed by Dr. Vannevar Bush of the Carnegie Institution of Washington. Dr. Bush happens to be a member of NACA; he will not resign. It could not be learned as this was written when the Commission will start to function, or what problems will be taken up first.

Other members appointed by Mr. Roosevelt are: Dr. J. B. Conant, president of Harvard; Dr. Richard C. Tolman, California Institute of Technology; Dr. Karl Compton, president of MIT; Conway P. Coe, Commissioner of patents; Dr. Lyman J. Briggs, director, Bureau of Standards; Dr. F. B. Jewett, president, National Academy of Sciences; and Secretaries Harry Woodring and Charles Edison, of Army and Navy. It is assumed the man who succeeds Edison, resigned, will also succeed to the research post.

BUSINESS ITEMS

Allis-Chalmers Mfg. Co. has just established a new branch office in the Knight Bldg., Quarrier and Hale Sts., Charleston, W. Va. R. L. Halsted, formerly connected with the company's Cincinnati district office has been made branch office manager.

Criterion Tool Sales, Beverly Hills, Calif., has completed facilities for the manufacture, sale and service of Vascoloy-Ramet carbide-tipped cutting tools.

Elastic Stop Nut Corp. has moved its general offices from Elizabeth, N. J., to its new plant at 2332 Vauxhall Road, Union, N. J. Transfer of manufacturing equipment has been completed. The corporation's Houston, Texas, office has moved to the Merchants and Manufacturers Building.

Mechanical Supplies, Inc., Manila, P. I., has purchased the business and stock of Berry Engineering Co. Donald B. MacAfee, president and general manager of the new corporation, states that particular attention will be given to marine engines, mining machinery, machine shop equipment, road and construction machinery, hydraulic pumping machinery and specialized equipment.

Michigan Tool Co., Detroit, Mich., has appointed Henry Walke Co., Norfolk, Va., as representative for its line of gear finishing, lapping and checking equipment and other tools. C. Howard Eden has been appointed Los Angeles representative, and D. E. Schellenbach San Francisco representative.

C. R. Mitchell, Jr., has been appointed assistant district manager of sales for the New York district office of Allegheny Ludlum Steel Corp., Pittsburgh, Pa. Deane Murphy has been named eastern manager of flat rolled carbon steels, with headquarters at the same office.

Peden Iron & Steel Co., Houston, Tex., have been appointed by Allegheny Ludlum Steel Corp. as agents for Allegheny Ludlum tool and high-speed steels in that area.

The Plainville (Conn.) Tool & Die Co. has started operations at 64 East Main St., as a corporation. C. O. Lassy, West Hartford, is president: R. P. Sneideman is vice-president, and H. M. Sneideman is treasurer.

Stacy Machine Works, Inc., has moved to new quarters at 70 Leete St., Springfield, Mass. This job shop also announces the acquisition of new equipment.

Heads Radio Group

JAMES S. KNOWLSON

Promoted by Buick

R. F. THALNER

Whiting V-P

MAX F. BECKER

Cimatool Sales

WILLIAM CREIDER

The George Scherr Co., 128 Lafayette St., New York, has been appointed national distributor for the line of micrometers manufactured by the Reed Small Tool Works, Worcester, Mass. These micrometers, manufactured for over 30 years, include four distinct models in 1-in. size and others from 2- to 6-in.

Whiting Corp., Harvey, Ill., has purchased the business of the Quickwork Co., 400 West Madison St., Chicago, Ill., manufacturers of Quickwork metal working machinery (shears, trimmers, power hammers). For the present the business will be conducted at the Chicago address as heretofore under the name Whiting Corp., successor, the Quickwork Co.

NAMES in the NEWS

Jack J. Borrup has been appointed production manager of Pratt & Whitney Aircraft Div. of United Aircraft Corp., Hartford, Conn. G. H. D. Miller has been appointed factory manager, while Daniel Jack has been named assistant factory manager. Mr. Borrup has been associated with the United Aircraft predecessors since 1925. First as superintendent and later as factory manager, he has been in charge of all P & W aircraft engine production since the original Wasp. He was previously employed by Crane-Simplex Motor Co., Wright-Martin Co., and Wright Aeronautical Corp.

William W. Rich, general manager, R. Wallace & Son Mfg. Co., Wallingford, Conn., has been elected president to succeed the late Charles D. Morris. Floyd Wallace, formerly vice-president, becomes chairman of the board. Warren Mottram succeeds Mr. Morris as member of the board of directors.

James S. Knowlson, president and board chairman of Stewart-Warner Corp., Chicago, has been elected president of the Radio Manufacturers Association for the coming year.

R. F. Thalner has been appointed personnel director of the Buick Div., General Motors Corp., succeeding the late Elmer H. Kramer. Mr. Thalner graduated from the University of Michigan in 1915, served overseas in the 310th Engineers during the World War. He has seen more than 20 years in personnel service at the Buick factory.

James W. Hook, president of the Geometric Tool Co., New Haven, head of the United Illuminating Co. of that city and Bridgeport, and past president of the New England Council, has been awarded the Marston Medal, the highest honor of the engineering division of Iowa State College for his work in manufacturing and civic affairs.

Wins Award

JAMES W. HOOK

Max F. Becker has been appointed vice-president in charge of sales representatives, Whiting Corp., Harvey, Ill. Mr. Becker has been associated with Whiting for the past twenty years, first having served in the Pulverizer Div. after his graduation from Purdue University in 1920. After several years in various departments he was made manager of the Whiting Foundry Equipment Div., and last year was made sales manager of the industrial division.

William Creider has been appointed machine tool sales manager of the Cimatool Co. and sales manager of the Sheffield Gage Corp., Dayton, Ohio. Mr. Creider has a long record in the metal-working field, having originally started with Union Switch & Signal Co. of Swissvale, Pa. For the past seventeen years he was associated with the Oil-Gear Co., Milwaukee, Wis., the last twelve of which as general manager.

F. W. Fenner has been appointed to the Cleveland district of Jessop Steel Co., Washington, Pa. W. H. Raisbeck has been appointed sales representative in the Milwaukee district.

W. L. Gourley has been elected president of Lehman Machine Co., St. Louis, Mo. Paul Lehman, former president, has disposed of his interest in the company, but will remain with the firm for the next year.

Carl J. Halborg has been elected president of the Colonial Broach Co., Detroit, succeeding the late Otto Lundell. Mr. Halborg has been associated with Colonial since 1918 and was previously secretary to the company. A. G. Lundell and Arvid Lundell were elected vice-presidents, the latter in charge of engineering. David A. Nelson was named secretary and treasurer.

G-M Defense

J. D. MOONEY

J. D. Mooney, vice-president in charge of the Overseas Group, General Motors Corp., has been transferred to Detroit as executive assistant to C. E. Wilson, acting president, in full charge of all negotiations involving defense equipment. This move is to improve coordination and administration of the Corporation's part in the national defense program. Graeme K. Howard, vice-president and general manager of overseas operation will assume general supervision of the Overseas Group. Albert Bradley, vice-president in charge of finances is transferred to Detroit to assume additional duties as executive assistant to the acting president.

Brooks Faxon, for the past 36 years New England manager of Wagner Electric Corp., with offices, at Boston, has retired. He is succeeded by Howard W. Petty, formerly manager of the company's Buffalo, N. Y., area.

Frederick G. Hughes, general manager, New Departure division, General Motors Corporation, was recently re-elected president of the Manufacturers Association of Hartford County, Conn.

Dr. Lincoln T. Work, associate professor of chemical engineering at Columbia University, has been appointed director of research of the Metal & Thermit Corp., New York. Beginning July 1, all of the corporation's research and development activities will be under his supervision.

D. W. Russell has been appointed president of Airtemp, Chrysler Corporation's air-conditioning and heating division at Dayton, Ohio. He will take over the duties of Col. A. C. Downey, who is on an extended leave of absence because of ill health. Mr. Russell was formerly vice-president of the Fargo division.

Lawrence V. Nagle has been elected vice-president of Udylite Corp., Detroit, Mich., instead of president, as incorrectly announced in AMERICAN MACHINIST for May 29. L. K. Lindahl has been re-elected president.

MacGilbray Shiras, director of raw materials for Carnegie-Illinois Steel Corp., Pittsburgh, Pa., has retired with a service record of more than 47 years.

J. H. Slater, formerly superintendent of blast furnaces and coke works of the Cleveland district, Republic Steel Corp., Cleveland, Ohio, has been appointed assistant manager in charge of steel works. H. H. Holloway, assistant district manager, has been placed in charge of all finishing mills. B. W. Norton, assistant district manager at Youngstown, has been transferred to the same position in the Warren district. J. H. Graft, assistant district manager at Warren, has been transferred to Youngstown in the same position.

PLANT EXPANSION

Air Associates, Inc., Bendix, N. J., has awarded contract for construction of a 40,000-sq.ft. factory and two-story office building. Development, representing an investment of over $300,000, will provide facilities for the manufacture of aircraft hardware parts and accessories.

Allegheny Ludlum Steel Corp. announces strides in the construction of a new building to house the stainless steel wire mill at its Dunkirk plant. This plant will be the only one of its kind in the U. S. devoted entirely to the production of stainless steel wire from the hot rod down to 0.003 in. gage.

Colt's Patent Fire Arms Mfg. Co., Hartford, Conn., has leased the Park St. factory of the United States Rubber Co. The plant has 100,000 sq. ft. of floor space which will be taken over by the electrical division of the Colt's Co.

International Harvester Co. plans a one-story addition, 147x685 ft., to its motor truck plant at Fort Wayne. Cost of equipment will approximate $450,000.

SKF Industries, Inc., Philadelphia, Pa., has awarded contract for alteration and expansion of the recently acquired Watson Stabilator Co. plant. Facilities are being increased to take care of demands from customers in all parts of the world, many of whom were formerly served by the SKF plant in Sweden.

Twin Disc Clutch Co., Racine, Wis., plans a plant expansion program to cost about $140,000.

Waterbury Tool Co. was awarded the contract for an addition of 23,000 sq.ft. to its plant on E. Aurora St., Waterbury, Conn. The new plant, to be known as the Waterbury Tool Division of Vickers, Inc., will increase this company's capacity on pumps and hydraulic speed gears.

OBITUARIES

Hyman Botwinik, 51, president and treasurer Botwinik Bros., Inc., Bridgeport, Conn., machinery dealer, died June 3 at his home following a heart attack.

Arthur J. Cole, vice-president, McGraw-Electric Co., Elgin, Ill., died June 11 at the age of 57. He had been with this company for 25 years.

James E. Cooper, 52, president Atlantic Mfg. Co., Milford, Conn., died May 27 at his home in Pawtucket, R. I.

David D. MacLaughlin, superintendent General Abrasive Co., Niagara Falls, N. Y., died suddenly June 9 in Providence, R. I.

Paul Mathewson, 53, president, Lyman Gunsight Corp., Middlefield, Conn., and vice-president, the Durham Mfg. Co., manufacturers of metal products, died June 10. Mr. Mathewson was one of the founders of the Durham Company seventeen years ago.

Harry T. McDonald, 48, research engineer Caterpillar Tractor Co., Peoria, Ill., died of a heart attack at his home in that city, June 3. He had been with the firm for 22 years.

Dudley Willcox, treasurer and assistant general manager of the Ajax Electrothermic Corp., Trenton, N. J., died on June 14 in the Princeton Hospital after an operation for appendicitis. His age was 53. Mr. Wilcox was graduated from Yale University in 1908. He was a member of the American Institute of Mining and Metallurgical Engineers and the Franklin Institute. He was to have taken office as president of the Trenton Rotary Club on July 1.

MEETINGS

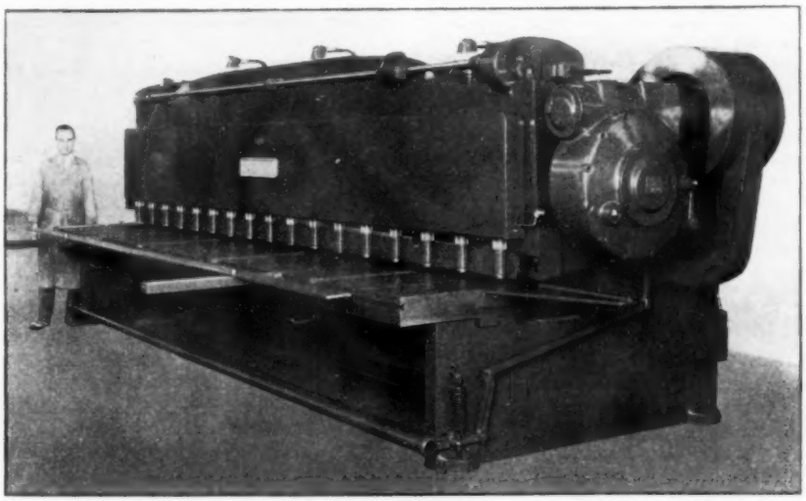
American Institute of Electrical Engineers. Pacific Coast Convention, Los Angeles, Calif. August 26-30.

National Foreign Trade Council. Twenty-seventh national foreign trade convention, San Francisco, Calif., July 29-31.

Silver Bay Conference on Industrial Relations. Twenty-third Annual Meeting, Silver Bay-on-Lake George, N. Y. July 24-27.

SHOP EQUIPMENT NEWS

Cincinnati 16-ft. All Steel Shear Has Capacity for Plates 3/8 in. Thick



Typical of the progress made in developing heavy plate shears is the Series 4316 all-steel shear built by Cincinnati Shaper Co., Cincinnati, Ohio, which has a length of 16 ft. and is capable of handling plates up to ⅜ in. thick. A 20-hp. motor is used. Length between housings is 195 in. At a flywheel speed of 800 r.p.m. the shear operates at a speed of 40 strokes per minute. Front gage range is 55 in. and back gage range is 36 in. Normal hold-down pressure is 24 tons.

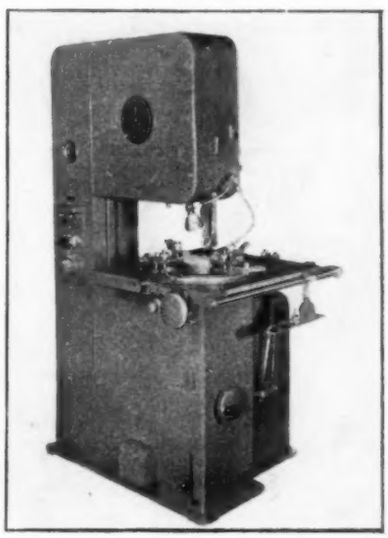
Features incorporated in this shear include hydraulic hold-downs which automatically clamp any thickness of metal with the same pressures to prevent creasing; low rake of the blade, which greatly reduces the twist in narrow strip; inclined upper knife, which produces a sheared edge square with the surface of the plate; micrometer dial; ball-bearing back gage, which is said to make gaging unusually rapid; a safety friction clutch, which provides protection against overloading; and all-steel construction, which provides maximum safety against breakage.

Continental Contour Machine Features Mechanical Feed

Continental Machines, Inc., 1301 Washington Ave. S., Minneapolis, Minn., has made available a contour sawing machine incorporating a mechanical work feed. Known as the "Super Doall," this model eliminates the necessity of hand guiding and gives complete mechanical control.

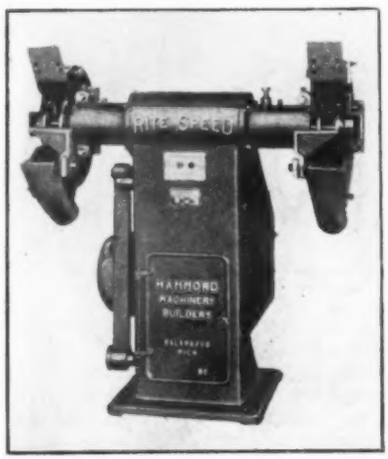
The machine accommodates saws up to 1 in. width as well as the usual range of narrow saws. All saws, files and polishing bands are fully guarded up to the point of work. Adjustable guides are placed even closer above and below the work than in previous models.

In the base of the cabinet is the 1½-hp. motor, and in the column is mounted the ¼-hp. motor to operate the grinder for the automatic butt welder. Remote control pushbutton starting switch is conveniently located. Overload protection is provided. A wiring box is furnished, so that the machine is shipped complete ready to attach wires and operate.



Hammond Wide-Swing Grinder Designed for Bulky Castings

A new addition to the Hammond line of grinders is the "Rite-Speed" multiple V-belt driven wide-swing grinder illustrated. Offered by Hammond Machinery Builders, Inc., 1618 Douglas Ave., Kalamazoo, Mich., this unit is a wide-swing four-bearing machine with totally inclosed fan-cooled motor mounted outside the base. This machine is recommended for grinding bulky castings, as it is not limited to standard motor speeds. It is particularly desirable in 25 cycle areas; despite the slower speed of 25 cycle motors, proper size sheaves can be furnished to drive wheels at the most efficient grinding speed.

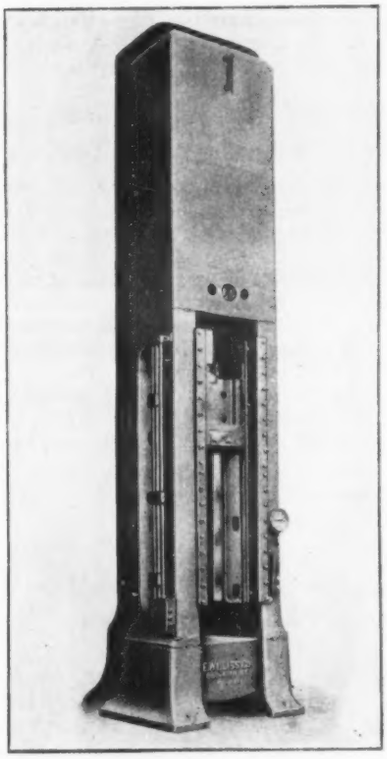


Specifications: Length of spindle, 46 in.; distance between wheels, 35 in.; size of base at floor, 20 x 20 in.; height from floor to center of spindle, 38 in.; guards, 12, 14 or 16 in. diameter; motor sizes, 3, 5 or 7½ hp.; net weight, 1100 lb.

Bliss "Hydro-Dynamic" Press Redraws Cartridge Cases

Modern in design, the 100-ton "Hydro-Dynamic" press has been developed by E. W. Bliss Co., 53rd St. & 2nd Ave., Brooklyn, N. Y., especially for redrawing cartridge cases. This fast, single-action, self-contained press incorporates an all-electric con-

trol as well as a direct pumping unit. The fast-acting valve system permits pressure control over a wide range. Pressure switches are furnished to avoid injury to the dies. Fingertip control by use of conveniently located pushbuttons permits easy and safe die setting operations, with increments of movement of $\frac{1}{32}$ in. readily obtainable. The press illustrated is

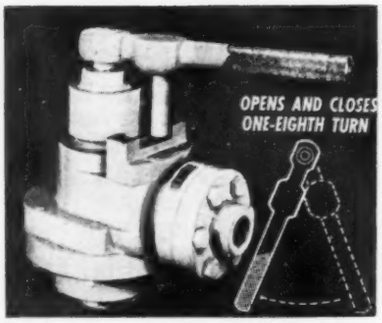


of rigid four-piece tie-rod frame construction, with keyed and fitted sections of hard high-test irons. Three stops are adjustable by a hand crank for automatic control of position. Transitions from rapid advance to high-pressure working stroke for quick return are fast and shockless. Maximum stroke of the press is 84 in. Bed area is 30 x 31 in.

Albright Stainless Valves Handle 4,000 lb. Pressures

Albright Equipment Co., 590 Crafts Bldg., Pittsburgh, Pa., has made available a series of stainless steel valves suitable for use on hydraulic presses and other machinery where high pressures are encountered. Marketed under the trade name of "Hydra," they may be used on water, steam and oil lines having pressures up to 4,000 lb. per sq. in. Valves are made in three body types: brass, bronze and steel. Standard sizes range from ½ in. to 2 in. diameters.

A principal feature of these valves is their case of operation, as only one-eighth turn of the handle is re-

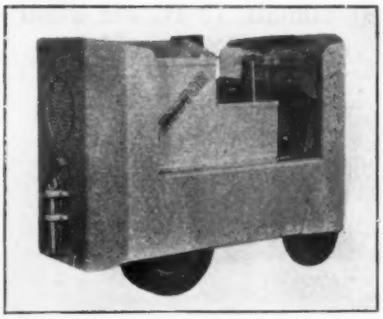


quired to open or close the valve. During this operation, the four stainless steel balls which close the valve are automatically engaged in port holes by line pressure. There are no valve seats to regrind. All internal parts are of stainless steel construction. Valves may be operated either by hand or by electirc solenoids with pushbutton control.

"Towmotor" Tractor Designed For Unwieldy Loads

Especially advantageous in handling unwieldy loads of steel in tubes or sheets with long overhang, the Model CS "Towmotor" tractor has been designed by the Towmotor Co., 1264 E. 152nd St., Cleveland, Ohio, for strenuous, heavy-duly pushing and pulling.

All contours are rounded to avoid catching obstructions. Special shields give driver and steering wheel more protection on sharp turns. Over-all width is 42 in., length 71½ in., outside turning radius 74 in. Two ⅝-in.



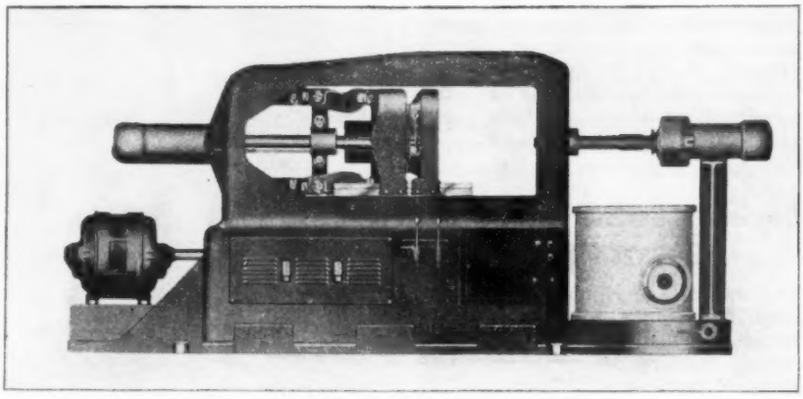
steel plate bumpers 48½ in. high by 42 in. wide form the integral end members of a rugged box-type arc-welded steel frame. The tractor has a drawbar pull of 4,000 lb. and will pull 130 tons on level concrete. Its industrial type power plant develops 41 hp. at 2,000 r.p.m., and is equipped with a three-speed transmission to provide any speed up to 8 m.p.h.

Phoenix-Lester Die Casting Machines Handle Aluminum, Brass and Magnesium Alloys

Lester Engineering Co. and Phoenix Machine Co., 2701–2711 Church Ave., Cleveland, Ohio, have made available two die casting machines, Models HHP-2X and HHP-3X, for aluminum, brass and magnesium alloys. Similar in design, they produce castings up to 2.2 lb. of aluminum and 6 lb. of brass in the case of the Model HHP-2X, and 3.3 lb. of aluminum and 9 lb. of brass in the HHP-3X machine. Changing the pot and injection plunger adapts them to zinc, tin, and lead alloys.

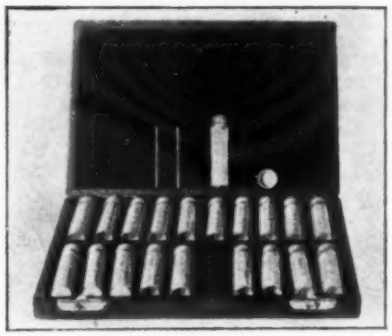
Solid beams replace tie bars, making for rigidity. Mold adjustment is by means of a worm and screw. These two features keep the mold platens always parallel to assure positive alignment. Positive mold-locking up to 800,000 lb. is attained through a link-and-link lock toggle system. Stress is removed from the pins and taken up by heavy end plates through the toggle links.

Speed of injection plunger and pressure on metal are variable. Sequence of operation is electrically controlled, as is the timing of each operation. Conventional accumulator bottle is replaced by a hydraulic system which develops tremendous pressure and maintains it throughout the operating cycle. Pressure upon the metal increases as resistance grows, which produces uniform density.



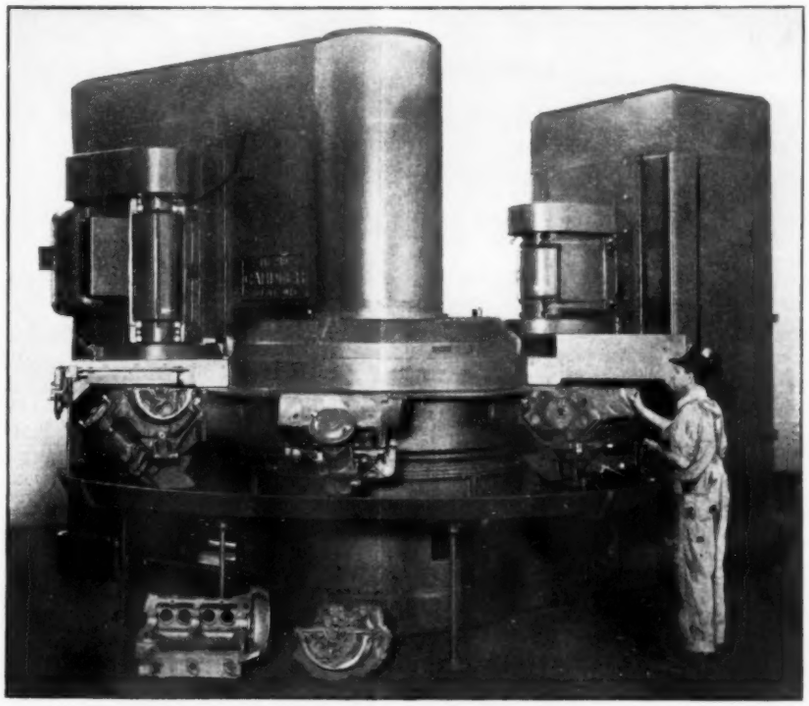
A limit switch prevents the injection plunger from functioning until the die is closed and locked. To promote safety, the operating lever is designed so that any operation may be immediately reversed.

Van Keuren Measuring Wires Gage Internal Spur Gears



The Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass., has announced a set of measuring wires, No. 26IN, suitable for checking internal spur gears. This is believed to be the first time that a suitable series of wires for checking internal spur gears has been made available. The series is based on sizes 1.44/DP. This gives a maximum number of sizes that are exact in even thousandths of an inch, and also result in some sizes being common with the external gear series, which is 1.728/DP. A complete set of tables giving measurements between the wires for even and odd tooth gears from 10 to 171 teeth, and for pressure angles of 14½, 20, and 30 deg. is available.

Gardner 34-ton Snagger Grinder Machines Five Blocks per Minute

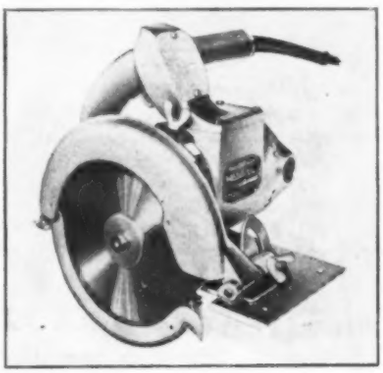


Weighing over 34 tons, the No. 219 four-head cylinder block snagging grinder developed by Gardner Machine Co., 410 E. Gardner St., Beloit, Wis., has a capacity of five V-8 cylinder blocks per minute with three operators. Machine was specially designed to snag grind bottom and both ends of the cylinder blocks at one setting. Four grinding heads are used, each pair being supported by a massive column. Each column is mounted on a rigid sub-base, which also supports the large rotary work carrier. Upon the left-hand column are mounted two heads, in line, each carrying an abrasive member for snagging the bottom surface of the cylinder block. The first head takes a roughing cut, while the second takes a lighter finishing cut. The right-hand column also carries two heads, one above the other, so that the grinding members are parallel.

The rotary work carrier is provided with six stations, each carrying a quick clamping fixture. A cylinder block is loaded by hand from a conveyor into a fixture, with the bottom surface up, and is carried beneath the first two grinding wheels. After leaving the second wheel it automatically is indexed 90 deg. so that when passing through the opposed wheels on the right-hand column the two end surfaces are ground simultaneously. Following this operation, the block is automatically reindexed to its original position and manually unloaded to a conveyor.

Black & Decker "Quick-Saw" Can Be Used With One Hand

The No. 85 "Quick-Saw" offered by Black & Decker Mfg. Co., Towson, Md., is a balanced, close-coupled one-hand saw having a 2⅝ in. depth of cut. It was developed to handle



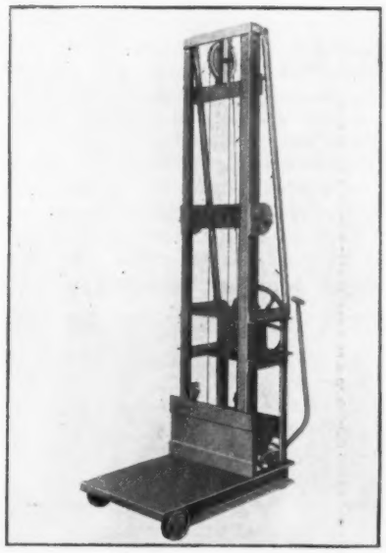
practically all popular lumber sizes. When used with the various disks and blades, this saw has a wide variety of uses such as ripping, cross-cutting, grooving, slotting, mortising, planing, mitering, beveling, tenoning, nail cutting, notching, at high speed in all types of wood. It is also capable of grooving, slotting and cutting with abrasive disks in stone, tile, asbestos, composition materials and all types of non-ferrous metals.

Safety features on this unit include trigger switch and automatic telescoping safety guard. It is available with a portable saw table which can be used to cinvert it into a table saw for accurate ripping, mitering, beveling, etc.

West Bend Hydraulic Lifter Handles Heavy Dies

Developed principally for use in handling heavy dies, the portable "Weld-Bilt" hydraulic die lifter offered by West Bend Equipment Co., West Bend, Wis., has also been designed to serve other needs in many types of manufacturing plants.

Hand operated, it has a full hydraulic raising and lowering unit mounted horizontally, beneath the platform, with finger-tip control located at the top of the operating handle. Platform has a net lift of 4 ft. and lowers to within 8 in. of the floor. Only a small amount of space is required for maneuvering

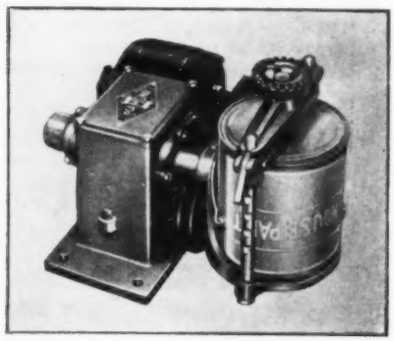


and operating, as full swing of the handle is not necessary. Pump handle can be locked in several positions.

The unit is of arc-welded construction throughout. Specifications: standard size, 24 x 24 x 66 in.; capacity, 500 lb.,; larger units available with capacity up to 2,500 lb.

Diamond Paint Conditioner Offered in Two Sizes

A paint conditioner designed for use in industrial plants has been placed on the market by the Diamond Iron Works, Inc., Minneapolis, Minn. This one arm mixer is made in two sizes; one for cans or buckets up to one gallon, and the other for cans having capacities from two to five gallons. These mixers operate on a reverse

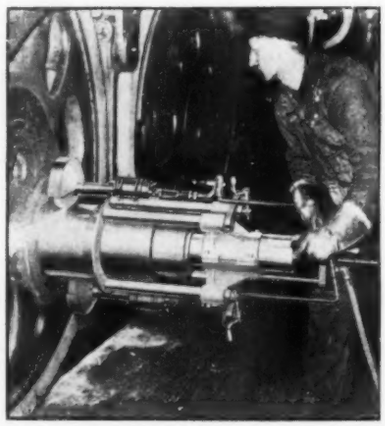


action principle, breaking up circulating currents by creating a powerful slushing effect which quickly conditions even old stock. The motion mechanism is completely inclosed, with lubricant reservoir giving splash lubrication to all bearings. The clamp mechanism is adjustable for the smallest can, or small cans can be stacked under the clamp bar when more than one can is to be mixed. The mixer is designed with shaft extensions on both sides so it can be converted into a two arm conditioner when desired.

"Milwaukee" Portable Grinder Reconditions Locomotive Crankpins

Available with either pneumatic or electric drive, the "Milwaukee" portable locomotive crankpin grinder manufactured by Goetz-Voss Corp., 6242 W. State St., Wauwatosa, Wis., reconditions crank pins with speed and accuracy.

All types and sizes of crankshafts may be ground quickly with this machine. The only operation required on the locomotive is the removal of the side rods; wheels are not dropped

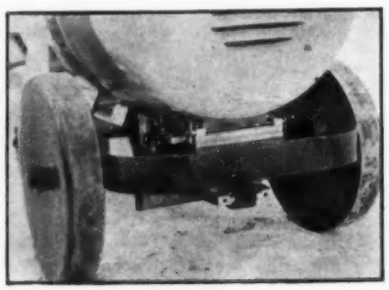


nor are guides removed. The grinder trues up crankpins by removing a minimum amount of stock. Grinding wheels furnished will remove stock quickly, while polishing wheels will produce any desired finish. No hand work is required.

Worn or cut trailer and car truck journals, holes in back-ends of main rods and similar jobs may also be reconditioned to advantage. It is shipped ready for use housed in a substantial metal storage and shipping case.

Automatic Device Starts and Stops Wilson Welders

Wilson Welder and Metals, Inc., 60 E. 42nd St., New York, N. Y., has announced an automatic start and stop device for use on any magnetic starter, motor generator arc welder, such as the Wilson "Hornet," which is driven by an a.c. motor. With this device the operator starts the welding unit simply by touching the work with his electrode holder. As long as



he is welding, the unit keeps running; when welding is interrupted, the machine automatically stops after a time delay, which may be set between ½ to 1½ min. to suit conditions of the particular job at hand. The time delay prevents undesirable frequent stoppings in case of a tacking job. It may be installed either on or near the machine.

Hancock "Duravalve Junior" Has Integral Stellite Seats

Hancock Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn., has developed a 600-lb. standard steel valve having a Stellite seat welded integral to the body. Known as the "Duravalve Junior," the valve has a body and bonnet of carbon molybdenum steel giving it a temperature rating of 950 F. at 600 lb. steam pressure.

Integral seat construction is said to have proved superior, based on over three years experience in 1,500-lb. power plant work, as it eliminates

leakage between seat ring and body. The valve disk is also heavily Stellited to resist wire-drawing and wear.

The new valve weighs from ⅓ to ½ less than comparable valves of conventional design. It is available in sizes from ¼ to 1 in. inclusive, in the globe type, with either screwed or socket welding ends.

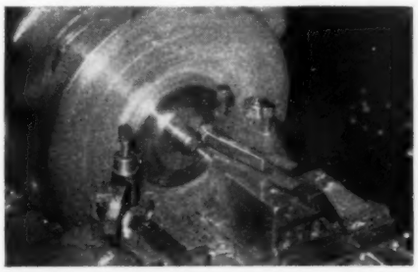
Jefferson Swing Grinder Uses 14" Wheels

The No. 101 swing frame grinding and polishing machine developed by Jefferson Machine Tool Co., Fourth, Cutter and Sweeney Sts., Cincinnati, Ohio, will grind and clean rough castings of any kind, shape or size. It also is used with standard buffing wheels for grinding or polishing sheets, tubing, bars and shapes too large for the usual standard floor lathes. A scratch wheel brush can be used for cleaning castings. The head is fully universal, it can be swung forward, and backward, up and down, right and left, and at any degree of

(Advertisement)

Carboloy Tools Step Up Production of Aluminum Aircraft Parts

Carboloy tools rough and finish face this aluminum aircraft part. Finish facing is done at a speed of 570 f.p.m., with a feed of .002″.



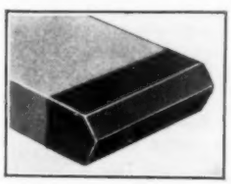
.003″ depth of cut. Tool life exceeds the 540 pieces in each lot. This application is but one of many jobs on which Taft-Peirce Manufacturing Company has applied Carboloy cemented carbide as a "general purpose" cutting material. This widespread use of Carboloy has resulted in an over-all production increase of 25% on the jobs where it has been applied.

Carboloy Tool Removes 20 lbs. of 1040 Steel Per Minute

Indicative of the trend towards the use of cemented carbide as a tool material for broad general purpose use in the shop rather than for a few hand picked production applications, is the report recently received from an Oklahoma job shop. This shop reports the use of Carboloy tools on "every conceivable job in the shop." One job specifically mentioned is the turning of heat treated 1040 S.A.E. forgings at 300 f.p.m., .036″ feed, with the cut ranging from $\frac{3}{8}$″ to $\frac{7}{8}$″ deep. 20 lbs. of steel are removed per minute, using a $\frac{7}{16}$″ sq. Carboloy tip, $1\frac{1}{2}$″ long, with a ground-in chip breaker. Another operation mentioned is the grooving of large cast iron sheaves from the solid at the rate of one groove every $1\frac{1}{4}$ minutes. A lot of 114 grooves were turned without grinding the Carboloy tools.

Speed Up Machinery Reconditioning with Carboloy-Tipped Scrapers

Increased production in many plants is taxing present machinery heavily and as a result of this many manufacturers are reconditioning their old equipment to meet production schedules. Carboloy-tipped scrapers are proving especially helpful in this work as they stand up for long periods of use. Fewer sharpenings means more time spent scraping. One large machine tool builder recently ordered a large quantity of these scrapers as they found that they lasted 2 or 3 hours against 2 to 4 minutes for steel scrapers. Carboloy-tipped scrapers in the hands of an experienced grinder, can be resharpened in a few seconds with a diamond wheel. Complete information can be obtained from Carboloy Company, Detroit.



Recent Carboloy Literature

Manual GT-122, recently issued, gives the latest technique for the rapid, economical grinding of Carboloy tools. It explains in detail the various operations required to free hand grind single point tools, presents grinding machine requirements and offers grinding wheel recommendations. Write for your copy.

Taft-Peirce USES CARBOLOY
TOOLS PROFITABLY
ON JOB-LOTS AS LOW AS ONE PIECE!
AGAIN—the general purpose use of Carboloy tools on small-lot, diversified work
. . . PAYS DIVIDENDS!

In addition to its well-known line of steel and carbide-tipped gages, the Taft-Peirce Manufacturing Company, Woonsocket, R. I., produces a large volume of contract work. This involves the machining of all common metals, such as steel, cast iron, aluminum, bronze, etc., and their alloys, in job lots which range from 1 piece to 1,000 or more pieces per lot, average quantities being between 24 and 75 pieces.

Some months ago, Taft-Peirce set out to determine whether Carboloy tools could be employed profitably on this diversified small-lot work. As a result, the following plan was adopted: (1) A "carbide application man" was appointed within the plant to follow and maintain all carbide tools, (2) A minimum number of carbide tools were designed, each suitable for broad general purpose use on many diversified jobs, (3) General purpose carbide grades of wide application were selected.

Today a relatively short time since its introduction, this general purpose carbide program is producing outstanding results. About 30% of all cast iron jobs and 20% of all steel jobs are machined profitably with Carboloy general purpose tools, and each day adds to this growing use. Significantly, Taft-Peirce can now apply carbides profitably even on 1-piece lots.

We shall be glad to discuss the benefits of a similar program on your own small-lot work.

CARBOLOY COMPANY, INC., 11149 E. 8-Mile St., DETROIT, MICHIGAN

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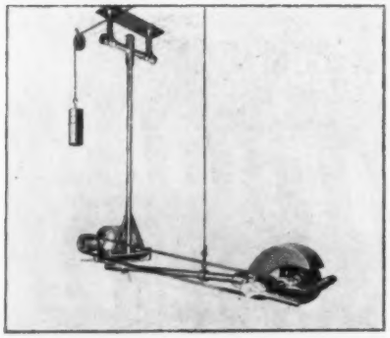


angle or twist of the spindle head. Over-all length is 93 in., while width is 26 in. It takes up to 14 x 2¾ in. grinding wheels or 14 x 3 in. buffing and polishing wheels. Either a flat belt or two V-belts can be used to connect motor and wheel spindle.

Palmer-Shile Barrel Truck Loads Automatically

This improved barrel truck made by Palmer-Shile Co., 7100 W. Jefferson Ave., Detroit, Mich., is of all-welded steel construction and weighs only 85 lb. Barrels weighing up to 1,000 lb. can be loaded with ease. It is necessary only to shove the truck up

against the drum, barrel or keg, drop the hook over the rim and the truck loads automatically without rocking or tugging, as the trucker puts a foot on the lower cross member and pulls back on the handle. The drum slips easily into position—the load being held securely at all times. The truck is narrower than the standard drum or barrel, so that it loads from a row as easily as when the barrels stand alone on the floor.

Improved Columbia Controls Feature Design Changes

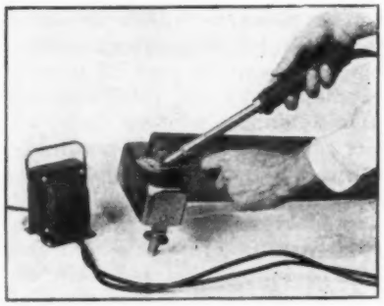
Improvements recently made in the JFS-Jr. Vari-Speed Control manufactured by Columbia Vari-Speed Co., P. O. Box 447, Wheaton, Ill., consists mainly in the inclusion of long bronze bushings on the center pulley halves which slide on the rotating shaft. These oversized bushings provide a more satisfactory bearing surface on the shaft than the previously used cast iron pulleys without the bronze bushings. Under each of these adjustable pulley halves are

suitable grease inlets which are fed by Alemite forced lubrication through the hollow shaft. Larger double sealed ball bearings are provided. A further design change has been made in the universal base structure. This base can be changed in position depending on the relationship of the drive and driven pulleys.

"Quick Heat" Soldering Iron Slashes Wasted Heating Time

Soldering temperature in less than a minute is the claim for the "Quick Heat" soldering iron announced by Ideal Commutator Dresser Co., 1057 Park Ave., Sycamore, Ill.

Through the use of a special carbon electrode heating element the tip is quickly brought up to soldering temperature. Carbon electrode makes contact at point of tip so that heat is concentrated where it is most effective. Heating is controlled by a



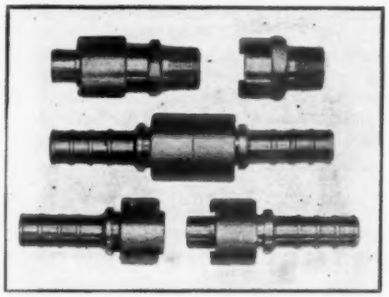
thumb-operated button on the handle of the tool.

The iron is recommended for all ordinary soldering purposes, as it is small and light in weight for easy manipulation. It is not recommended for continuous duty. Complete assembly includes transformer, soldering iron and leads. Transformer is rated at 500 watts, 110–6 volts, 50–60 cycles. Other voltages and frequencies are available. Shipping weight of the complete unit is 9 lb.

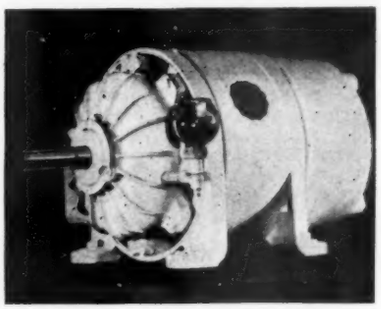
"Fuline" Hose Couplings Open and Close Quickly

Pittsburgh Brass Mfg. Co., 3261 Penn Ave., Pittsburgh, Pa., has developed a line of quick-operating bronze hose couplings for joining similar or dissimilar sizes of rubber hose on air, water, steam and gas lines operating at up to 200 lb. pressure. Marketed under the trade name of "Fuline," they are applicable to steel mills, railroads, public utilities, chemical, marine and construction industries.

In addition to the quick opening and closing features, these hose coup-



lings employ a positive locking device for increased safety. Standard sizes are available for ⅜, ½ and ¾ in. hose. Larger sizes can be built to specifications.



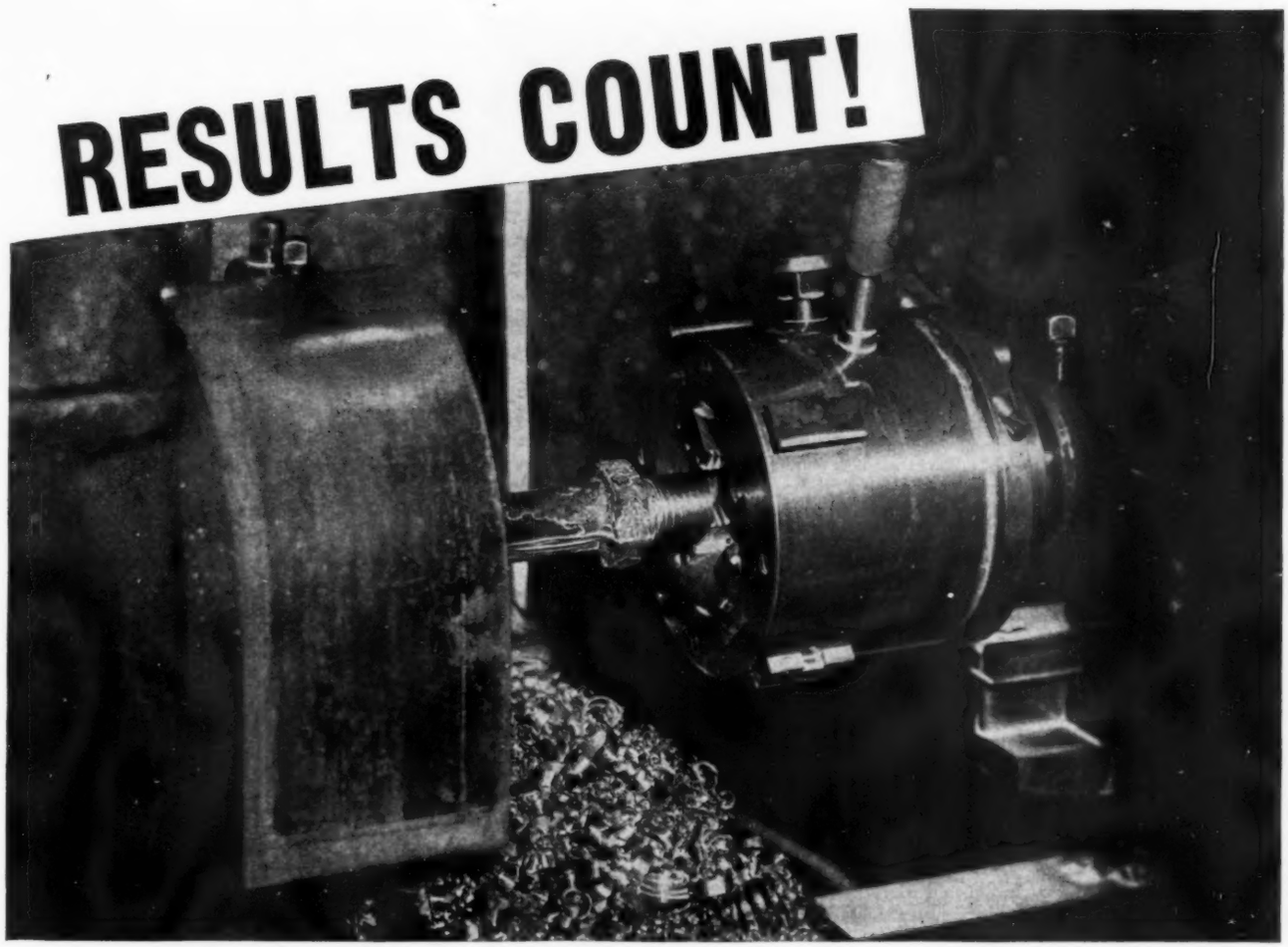
U. S. Ball-Bearing Motors Now are Oil-Lubricated

Explosion-proof motors for Class I Group D and Doublenclosed motors manufactured by U. S. Electrical Motors, Inc., Dept. 23, 80-34th St., Brooklyn, N. Y., now come equipped with oil lubricated ball bearings and constant level oilers. They are furnished as standard on all 3600 r.p.m. ratings and on all 1800 r.p.m. ratings larger than 25 hp. The use of oil lubricated bearings and constant level oilers is said to contribute to longer bearing life. Sufficient oil always is present.

"Ducon" Soldering Irons Feature Fountain Feed

The Ducon "Solder Master" electric soldering tool, made by Dual Remote Control, Inc., 31776 W. Warren St., Wayne, Mich., allows the operator to

RESULTS COUNT!



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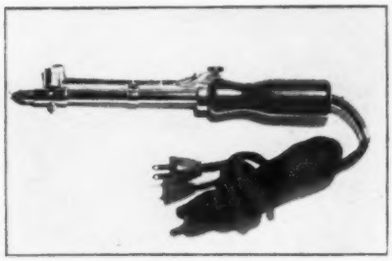
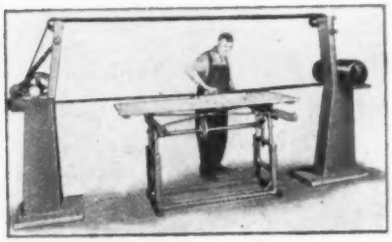
have a free hand to hold or adjust parts being soldered together. Solder is delivered a drop at a time by depressing a trigger. The drop issues from a small tip under the reservoir pot on the tool head. Size of drop is controlled by a button on the handle. Other features includes the 60-watt heating element made of nichrome



wire and porcelain, and a spill-proof cup which holds 48 drops of solder. Over-all length of the tool is 12 in., and operation is on 115 volts, a.c. or d.c. Net weight is 11 oz. Factory sales and distribution will be handled by Ducon Sales Co., 2816 David Stott Bldg., Detroit, Mich.

Jefferson Belt Sander Eliminates Hand Sanding

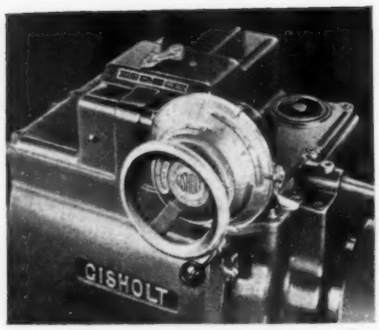
Large flat surfaces, as well as concave, convex or irregular surfaces, on wood or metal can be polished rapidly with the endless belt sander made available by Jefferson Machine Tool Co., Fourth, Cutter and Sweeney Sts., Cincinnati, Ohio. The flexible sanding belt responds quickly to the oper-



ator's touch. The table stands 32 in. above the floor and is adjustable up to 42 in. The table top measures 30 in. wide and 72 in. long, and is mounted on ball bearing rollers. Sand belts up to 8 in. wide can be used. Drive is direct from a 2 hp. motor and the belt travels approximately 1,800 ft. per min. for metal finishing. For wood finishing the belt is traversed at approximately 5,000 ft. per min.

Gisholt Speed Selector Available for Turret Lathes

Application of a speed selector to Gisholt high-production turret lathes has been announced by the manufacturer, Gisholt Machine Co., 1201 E. Washington Ave., Madison, Wis. Case studies show that the addition of this automatic speed-changing device has



reduced floor-to-floor machining time on many parts by as much as 50 per cent. Merely by turning the selector dial to the graduation corresponding to the diameter of the work, the machine automatically shifts to the correct spindle speed for that diamter. The change in speeds is accomplished without slowing down the machine.

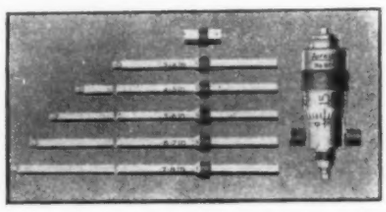
Square D Connectors Do Not Require Solder

Designed for use either as a solderless connector, or as a solder lug, a new connector introduced by the Square D Co., Detroit, Mich., covers a wide range of wire sizes which may be required for the device with which it is used. Each connector has only

two parts, a cast lug and a special set screw. The inside of the lug is shaped to obtain maximum holding power on all wire sizes within the limits of the lug. These lugs are designed to hold solder and to function as solder lugs if desired. All of these lugs have passed the latest Underwriters' Laboratories tests for solderless connectors.

Lufkin Introduces Line Of Low-Price Micrometers

Lufkin Rule Co., Saginaw, Mich., has made available Series 80 inside micrometers, which are substantially



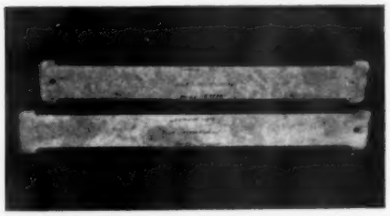
lower in price than the Series 680. They are designed for mechanics who do not require some of the features found only in the No. 680 line.

In the No. 80 micrometers, the range is obtained by use of extension rods and collars, the No. 80A set having six rods and a ½ in. collar which provides a range of from 2 to 8 in., and the No. 80B set having ten rods and a ½ in. collar, giving a range of from 2 to 12 in. Both have ½ in. movement of the screw.

Provision is made for adjusting tension and taking up wear on the screw. Contact points of the rods are adjustable to maintain individual length. All contact points are hardened and ground.

McKenna Offers Gages for Checking Cylinders

The McKenna Metals Co., 103 Lloyd Ave., Latrobe, Pa., has announced that go and no-go gages tipped with "Kennemetal" now are available for accurate gaging of cylinders, tub-



ing and other parts where the dimensions must be held to close tolerance. As shown in the illustration, these gages consist of notched steel blanks with small pieces of Kennametal brazed at both ends where the work is measured. Difference in width between the "go" and the "no-go" end on the two gages illustrated is 0.002 in. Gages can be made to measure any practical tolerance on almost any diameter.

Westinghouse Relays Have Plug-In Construction

A complete line of relays with plug-in construction has been announced by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. This makes it possible to remove the completely assembled relay in its case from the switchboard to a more convenient or better equipped location for testing, inspection or adjustment. The terminals of each relay extend from the rear as bayonet fingers which engage with the spring-clip receptacles as the relay is pushed into position. The plug-in contacts are so designed that removing the relay from its switchboard position does not disturb any of the circuits to which it is connected. False operation of circuit breakers or open-circuiting a current transformer are prevented by contacts which operate

automatically when the relay is removed. Existing relays made by Westinghouse can be converted to the plug-in construction simply by screwing the moving blade members of the disconnecting contacts into the standard relay studs and changing the case.

Wiremold Lamp Controls Made For Fluorescent Units

The Wiremold Co., Hartford, Conn., has announced a complete series of controls or auxiliaries for use with all sizes of fluorescent lamps. The line includes a complete series of controls with a power factor of 90 per cent or more for both single lamp and two lamp split-phase operation. An important feature is the development of two-lamp controls so compact in size that they will fit within the No. 300 fluorescent lighting channel, making an extremely compact installation. These two-lamp controls have high power factor, reduced stroboscopic effect and built-in compensators. This company also is offering a self-contained luminaire for fluorescent lamps. Designed to take two 49-watt lamps, is supplied completely wired, ready for installation.

Atlantic Grinding Wheel Developed for Weld Grinding

The Atlantic Abrasive Corp., 516 Pearl St., South Braintree, Mass., has made available an improved grinding wheel especially designed for weld grinding and snagging operations. Designated as the Type AK wheel, this wheel makes use of a synthetic bonding material which permits maximum working speed and pressure without danger of burning.

Welding Nuts and Brackets Made in Rectangular Form

New products consisting of rectangular welding nuts, rectangular welding bosses and welding brackets have been made available by the Ohio Nut and Bolt Co., 600 Front St., Berea, Ohio, to take advantage of economies possible through the use of electrical resistance welding machines. The welding brackets, bosses or nuts are made of the same material as the part to which they are to be welded. Rectangular welding bosses are available for production in sizes ranging from ⅜ in. wide, 1 in. thick, and ½ in. long; up to $1\frac{1}{8}$ in. wide, ⅜ in. thick and 1 in long. The rectangular welding nuts are available in a similar range of outside dimensions and with threaded holes for assembling with screw threads ranging from ⅛ to ⅝ in. diameter. The welding brackets may have projections on one or both legs, and the welding projections may be placed on either the outside or the inside part of the leg. Usually the leg should

5 REASONS FOR USING . .

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1 **Every pound of steel in Ryerson stock is certified, prime quality.** No seconds are ever carried. Ryerson has built up complete stocks of these better steels in every classification—steels made to narrow, close-range specifications that assure better working qualities. For example: Ryerson Hot Rolled Bands will bend flat on themselves either with or against the grain; Continuous Mill Sheets in Ryerson stock are rolled from only the best part of the coil to make sure of flatness, accurate gauge and size; structural shapes and plates meet A.S.T.M. specifications not simply manufacturers standards; machine and carriage bolts have cut—not rolled—threads, etc.

2 **Ryerson Certified Steels cut labor costs.** These better steels are free from hard or soft spots and can be depended upon for uniform working and forming qualities. Spoilage and breakage are reduced, proving Ryerson Certified Steels are superior for close-tolerance work, automatic equipment, and production line applications.

3 **Ryerson stocks are complete and diversified.** You save time, trouble and money by concentrating all steel requirements with this one dependable source of supply. Stocks include everything from structurals to stainless—from mechanical tubing to foundation bolts. Many special analyses and unusual sizes are included in the wide range of Certified Steel products in stock for Immediate Shipment.

4 **The special quality control plan on Ryerson Certified Alloy Steels** assures uniform heat treatment response and eliminates testing, experimenting and reheating. Complete chemical and physical properties, and the exact heat treating characteristics of each bar are sent with the steel to guide the heat treater in quickly securing any desired result.

5 **Ryerson Certified Steels cost no more.** You pay no premium for the uniform high quality of Ryerson products. Rely on Ryerson. Stocks are ample, and prompt shipment is assured. If you do not have the Ryerson Stock List—the guide to Immediate Steel—we will gladly send a copy on request.

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be of equal length and can be made with legs measuring up to 1½ in. long. Width of the brackets range from ⅜ to $\frac{13}{16}$ in. and thickness is the same for each leg, ranging from ⅛ to ⅜ in. Welding brackets are furnished with tapped holes in one or both of the legs, or with drilled or reamed holes that serve as bearings for push rods or revolving shafts.

NEW MATERIALS

Jessop Cold Heading Steel Provides Increased Life

A steel for cold heading dies, made by an improved process which is said to eliminate the porous center of the cast ingots and thus insure a sound steel capable of long tool life, has been developed by Jessop Steel Co., 595 Green St., Washington, Pa.

Known as Jessop Cold Heading Die Steel, it can be used to advantage in either solid or open die cold-heading work, and requires no change in regular shop practice. It is made from electric-furnace steel, the grain size of which is carefully controlled to permit wide variation in hardening temperature without coarsening. Experience has shown that a shallow hardening penetration is best for small dies, while a deeper penetration is better for large dies. Variations in penetration can thus be safety effected through variations in hardening temperature; a higher temperature resulting in deeper penetration and vice versa.

Tamms Floor Dye Colors Cement Floors

A floor dye suitable for coloring cement or concrete floors has been made available by Tamms Silica Co., 228 N. La Salle St., Chicago, Ill., also can be used for waterproofing such surfaces. This dye, available in six shades, has penetrating qualities that fill all open pores. The dye dries to a flat finish, is void of gloss or glare, and stays put almost indefinitely. It is easy to apply, either with lambs wool applicators or large brushes.

"Flexrock" Flexseal Liquid Waterproofs Buildings

Basically the same material was used for waterproofing airplanes, "Flexseal" made by Flexrock Co., 2300 Manning St., Philadelphia, Pa., is made of nitrocellulose, lacquer, oils and solvent, and is claimed to be especially efficient in waterproofing coarse building materials. This product has a penetrating nature, yet it has enough "body" to clog up any pores, open spaces or voids in the surface texture of mortars, concrete, bricks and stone.

TRADE PUBLICATIONS

CLAMPING TOOLS Catalog No. 4, issued by Knu-Vise, Inc., Detroit, Mich., contains 16 pages of specifications concerning an extensive line of hand-operated toggle-action clamping tools.

ENAMEL A technical data bulletin on "Codur" high-speed synthetic enamel has been published by Maas & Waldstein Co., 438 Riverside Ave., Newark, N. J.

FORMING Bulletin No. 77-B, issued by Niagara Machine & Tool Works, 637–697 Northland Ave., Buffalo, N. Y., provides 12 pages of information concerning a line of power-operated heavy slip roll forming machines.

GEAR MAKING EQUIPMENT National Broach & Machine Co., Shoemaker & St. Jean Sts., Detroit, Mich., has published a 12-page illustrated folder describing the "Red Ring" line of gear making and checking equipment.

INDUCTION HARDENING Principles and applications of the "Tocco" hardening process are provided in a 12-page illustrated bulletin now being distributed by Ohio Crankshaft Co., Cleveland, Ohio.

INSTRUMENTS "Little-Known G-E Products for Industry," a 20-page illustrated booklet, No. GES-2136, has been made available by General Electric Co., Schenectady, N. Y.

LIGHTING A 6-page illustrated folder offered by Hygrade Sylvania Corp., Salem, Mass., discusses features of "Miralume" HF-100 fluorescent lighting units.

MAINTENANCE A folder issued by Ideal Commutator Dresser Co., 1250 Park Ave., Sycamore, Ill., describes and illustrates many devices for electrical equipment maintenance.

MOTORS Features of a line of squirrel-cage induction motors, of 100–1,500 hp., are discussed in a four-page illustrated folder, No. GEA-1807B, offered by General Electric Co., Schenectady, N. Y.

MOTORS Design features of small motors for use in business machines are provided in leaflet No. F-8492, available from Dept. 7-N-20, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

SPRINGS Hardware Products Co., 103 Richmond St., Boston, Mass., has just published a listing of 234 sizes of stock compression springs with complete mechanical data on each spring. These springs range in length from

¼ to 24 in., and in diameter from ⅛ to 4 in., with wire sizes from 0.016 to 0.500 in.

TURRET LATHE A six-page illustrated folder issued by Bardons & Oliver, Inc., 113 W. 9th St., Cleveland, Ohio, provides specifications of the No. 3 universal and plain turret lathes.

VIBRATING PACKERS Bulletin No. 30, issued by Ajax Flexible Coupling Co., Westfield, N. Y., provides 4 pages of information concerning "Ajax" vibrating packers.

WASHERS Wrought Washer Mfg. Co., Milwaukee, Wis., lists thousands of washer specifications in various materials in its new stock list, No. 55-C.

WELDING Bulletin No. 160, issued by the Industrial Div., Ransome Concrete Machinery Co., Dunellen, N. J., contains 6 pages showing design, construction and applications of its revolving-tilting welding table.

WELDING Bulletin No. B-6049, issued by Allis-Chalmers Mfg. Co., Milwaukee, Wis., discusses the "Weld-O-Tron" low-current electronic welder for precision work.

WELDING ACCESSORIES A 20-page booklet issued by Hobart Bros. Co., Box EW-68, Troy, Ohio, covers an extensive line of arc welding electrodes and accessories.

NEW BOOKS

IMPACT CLEANING—*By William A. Rosenberger, consulting engineer. 466 pages. The Penton Publishing Company, Penton Bldg., Cleveland, Ohio. $7.00.*

Sand-blasting has grown up during the past few years. Starting, as have many of our industrial techniques, on a rule-of-thumb basis, it has now become a subject of engineering consideration.

While sand-blasting is the grandfather of impact cleaning, many processes which have grown from it use neither sand nor blast. Other forms of abrasives are common and other means of producing the impact have been found. The author discusses all of these, not as a handbook, but as a guide to the buyer and user of sand-blast equipment.

In doing this, he gets down to first principles. He talks of abrasives, the means of handling them to perform useful work, their effectiveness and their reclamation. He speaks of compressed air and the centrifugal means of propelling abrasives which he traces back as far as 1870.

This leads to a full treatment of the various types of equipment with particular reference to troubles and remedies. Dust removal and safety receive due consideration.

A NEW TECHNIQUE FOR SUPERVISORS AND FOREMEN—*By Albert Walton, Ph.D., assistant professor of psychology, Pennsylvania State College. 233 pages. McGraw-Hill Book Company, 330 West 42nd St., New York. $3.00.*

Can psychology be applied to scientific management? The author is convinced that it can be.

After being actively engaged in the field of industrial engineering with a variety of corporations, large and small, he studied the subject of psychology and was amazed by its application to his past experience. In this application he finds his "New Technique."

He finds that what people get out of the use of their ability depends largely on their psychological approach. Their aptitudes, their resistance to change, even their personalities are dependent on their manner of thinking. Fatigue and accidents are largely the results of emotional attitudes.

Psychology may not be a new thing in industrial relations; but it is interesting to get the reaction of a man who reversed the usual process by gaining the experience first and learning the theory afterward.

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MACHINE SHOP TRAINING COURSE—*By Franklin D. Jones. Vol. I, 474 pages; Vol. II, 552 pages. Published by The Industrial Press, 148 Lafayette St., New York. $6.00 for two volumes; $4 for either, if purchased separately.*

Question and answer technique is employed by the author in two volumes designed for shop courses in machine shop practice. In this way he covers all branches of metal-working operation, starting with the fundamental principles and following with descriptions of specific types of machine tools. Each question is answered fully and clearly in logical sequence.

Volume II includes definitions of over 300 shop terms frequently encountered in practice.

Mr. Jones attempts to stimulate student interest by explaining why as well as how the various mechanical operations are employed. The volumes contain both elementary and advanced shop work and are recommended for both self instruction and for trade school use.

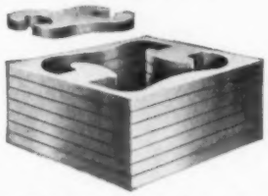
•

PROCEDURE HANDBOOK OF ARC WELDING DESIGN AND PRACTICE—*Sixth Edition. 1117 pages. The Lincoln Electric Company, Cleveland, Ohio. Price $1.50 in U.S.A.; $2 elsewhere.*

Welding has moved fast in the past few years. It is not surprising therefore to find that the Procedure Handbook has again been thoroughly revised after only a little more than two years' use.

Changes have been so numerous

DoALL DOES ITS STUFF IN ENGLAND



George P. Barrott writes from Banstead, Surrey, England:

"We now use 5 DoAlls in our small works at Mitcham and these are engaged 24 hours a day on production of gauges and tools of all types; in fact, it has become quite natural for us to cut out all our intricate high speed form tools and cast steel gauges, placing them on top of each other so that a thickness of 5 to 6" becomes a normal production. The saving of material is important—over 5 cwts during the last 6 months at an average price of 4/6d per lb."

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that no attempt will be made to list them here. However, the chapter on designing for arc-welded steel construction of machinery includes new data on how machine parts are built from standard rolled shapes; design studies of machine parts and complete assemblies; case studies of change-over to welded design; illustrated examples of welded design, both large and small; and studies of design developments.

The new volume is improved in physical make-up with better arrangement of type matter and illustrations. The book is printed on lighter stock giving a reduction in size over the fifth edition despite the inclusion of 20 per cent more material.

Those familiar with previous editions know that this excellent contribution to the literature of arc-welding technique is written as a practical help to designers and fabricators of welded products. The present volume is the result of the joint efforts of a staff of 200 arc-welding engineers.

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Legal

LEGAL ASPECTS OF ENGINEERING—*By Walter T. Sadler. 631 pages. John Wiley & Sons, 440 Fourth Ave., New York. $4.*

Should the engineer study law? Certainly not, if by "study" is meant a detailed application to the subject such as would qualify him to become a member of the bar.

However, the law is so highly significant to the engineer it will not hurt him one bit to know something about it. In fact, an acquaintance with its general principles may avoid situations that may involve the engineer's employer or client in unsuccessful litigation.

It is the purpose of this volume to provide a general understanding of certain pertinent branches of the law. The presentation follows casebook methods rather than a recitation of abstract doctrine. Some 300 odd cases have been selected, and these in themselves are an object of interest. Studying them provides mental stimulation and serves to fix the principles involved in the reader's mind much more surely than an account of legal theories alone.

TO THE EDITOR

John—Not Jerry

Dear Sir:

There were a number of discrepancies in "The Jerry Coffin Case", by H. M. Lane (*AM*—Vol. 83, page 958) that should be corrected as it is assumed that your paper will be looked upon as a "source," in things mechanical, for a long time.

In the first place, John E. Sweet was never at the head of Sibley College—he was in charge of the machine shop. I first met him in 1880, when he was building the so-called straight-line engine, a beautifully designed and splendidly built high-speed steam engine.

Friction had arisen between Sweet and Prof. W. A. Anthony, head of Sibley College, and he had resigned some time before.

Knowing the two men as I did, it was easy to understand that the co-efficient of friction was quite high.

Coffin's name was John—not Jerry, as stated by Mr. Lane.

Coffin did not design the planimeter—that instrument had been invented by Amsler long before, and was well known. I used one in 1879.

Coffin did, however, design an averaging instrument of great ingenuity but which did not come into general use.

Coffin did not go to Homestead—he went to the Gautier Steel Department of the Cambria Iron Company of Johnstown, Pa., where he was very successful in the treatment of steel.

In 1888 he assigned two patents for "Toughening Railway Rails" and one patent on "Toughening Axles" to the Cambria Iron Company.

A somewhat detailed account of his method of treating axles appeared in *American Machinist* and reads very much like a modern treatise on normalizing steel.

Coffin over-exerted himself in relief work after the Johnstown flood and died of typhoid, as stated.

Yours very truly,
C. M. CONRADSON.

Apprenticeship—A Last Resort?

Dear Sir:

Your editorial "Bewildered, Not Lost!" is good, but what about the unions? They are the ones who have throttled the training of apprentices—not the employers.

If you will get copies of agreements between employers and unions, you will find that there is a clause referring to the apprentices. It is this clause that has made employers skittish, that and the New Deal laws referring to the employment of boys under a certain age. You cannot take a boy or young man twenty years old and make a machinist out of him, unless he has been starved into taking that as a last resort.

Also, Pa and Ma say that "My boy must be a white collar employee." Have you a boy? Would you apprentice him to learn the machinist trade when only ten, or even sixteen, years old? Figure that out and give us a reply. Other parents are no different from you. A half-shot quack of a doctor is better to the sight of a mother, and a lawyer who sells his services to gangsters is looked up to by Pa more than if he was a dirty-handed machinist!

Very truly yours,
C. G. WILLIAMS
Davenport, Iowa